

Programmatic Biological Assessment
For Federally-Listed species:
Gray wolf, Canada Lynx,
and their Critical Habitats.
for the
Superior National Forest

May 17, 2011

USDA Forest Service – Region 9
Superior National Forest
8901 Grand Avenue Place
Duluth, Minnesota 55808

Executive Summary

The Forest Plan for the Superior National Forest establishes and guides the course of management actions, activities, and programs for the Forest Planning cycle. In July 2004 the Forest Plan Revision documented the potential effects of the implementation of the Revised Plan on three federally-listed species that occurred on the Superior National Forest.

- Bald Eagle (threatened status)
- Gray wolf (threatened status)
- Canada lynx (threatened status)

Since then some changes have occurred. On August 9, 2007, the bald eagle was removed from the federal list of threatened and endangered species. Although they are delisted, bald eagles are still protected by the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. The bald eagle then became a Regional Forester Sensitive Species for the Superior National Forest (aka Forest). The Forest continues to monitor the status of bald eagles in cooperation with other federal and state agencies, and conserve bald eagle habitat through protective measures contained in the Forest Plan (USDA 2004). Since the bald eagle is no longer a federally-listed species it is not addressed in the biological assessment (BA).

On April 2, 2009 the US Fish and Wildlife Service (USFWS) announced that gray wolves in the Western Great Lakes had recovered and no longer required the protection of the Endangered Species Act. The final rule formally identifies gray wolves in the western Great Lakes as a distinct population segment under the Endangered Species Act. However, in response to a legal challenge, the Service withdrew the April 2, 2009 final rule that

delisted the Western Great Lakes population of gray wolves on September 16, 2009. This reinstated protections for the gray wolf in the Western Great Lakes area. Since 2004 new information is available for gray wolves in northern Minnesota. Therefore the gray wolf is addressed in this biological assessment.

On May 4, 2011 the USFWS published a proposed rule to remove gray wolves from the Endangered Species Act in the Western Great Lakes area and no longer require protection of the ESA (USDI 2011).

On February 25, 2009 the USFWS designated revised critical habitat for the Canada lynx Distinct Population Segment (DPS) with Minnesota being one of five units with revised critical habitat (USDI 2009). The majority of National Forest Lands are within the designated lynx critical habitat area.

Therefore this biological assessment is addressing whether the designation of lynx critical habitat on the Superior National Forest will require changes in the current Forest Plan. Since 2004 there has been no new or revised lynx conservation direction with the exception of the designation of critical habitat on February 25, 2009. The Superior National Forest has not received any additional special management considerations or protections from the USFWS during project consultation beyond what is contained within the existing 2004 Forest Plan. To date no recovery plan has been developed for the species.

In addition, this BA revisits the determinations made in the 2004 BA for gray wolf and gray wolf critical habitat based on changes in management direction and/or past, present or reasonably foreseeable future projects since 2004.

Proposed and Probable management activities and programs

The proposed and probable programs and management activities described in the 2004 Programmatic Biological Assessment (BA) have not changed (USDA 2004b – Executive Summary). This BA tiers to the Programmatic Biological Assessment for the revision of the Forest Plan (USDA 2004b). This BA addresses the designation of critical habitat on the Superior National Forest (aka Forest) for Canada lynx, and addresses new information that has developed Canada lynx and Gray wolf since the implementation of the Forest Plan.

Standards and Guidelines

The analysis in this BA addresses the effectiveness of existing Plan direction, including objectives, standards, and guidelines (Chapter 2 and 3); and the results from monitoring and evaluation (Chapter 4) since 2004, to new information for gray wolf, and the designation of lynx critical habitat since the original 2004 BA was completed standards and guidelines are not included in effects summary Table A. below.

This is because they generally do not prescribe or propose actions. Instead they provide technical direction and required or preferable limits to activities if and when actions are undertaken.

As such, since the Forest Plan was approved in 2004 the implementation and effectiveness of standards and guidelines applicable to conservation measures for federally-listed species and critical habitats were analyzed in this BA and were

important in making determinations of effect.

This analysis assumes that standards and guidelines would be applied appropriately and would be effective in reducing or eliminating negative impacts to federally-listed species.

Determination of Effect

To make a determination of whether implementation of the 2004 Forest Plan is likely to affect listed species or designated critical habitat the definitions for determinations of *effect*, used in Section 7 consultations from the Endangered Species Consultation Handbook (USDI FWS and NMFS 1998), are used. In making the final determinations in this BA the following conclusions were considered.

- **No Effect** – the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or its designated critical habitat.
- **May Effect** - the appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat. When the Federal agency proposing the action determines that a “may affect” situation exists, then they must either initiate formal consultation or seek written concurrence from the Fish and Wildlife Service that the action “is not likely to adversely affect” (see definition below) listed species.
- **Is likely to adversely affect** – the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed

action or its interrelated or independent actions, and the effect is not: discountable, insignificant, or interdependent actions, or beneficial. In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action “is likely to adversely affect” the listed species. If incidental take is anticipated to occur as a result of the proposed action, then an “is likely to adversely affect” determination should be made. An “is likely to adversely affect” determination requires the initiation of formal section 7 consultation.

- **Is not likely to adversely affect** – the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species. **Insignificant effects** relate to the size of the impact and should never reach the scale where take occurs. **Discountable effects** are those extremely unlikely to occur. Based on best professional judgment, a person would not: 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur.

The Determinations of Effect and the rationale for the Determinations are briefly summarized below. The Summary of Effects upon which the Determinations of Effect are made is found in Table A below. Documentation can be found in the **Determination of Effect Section** of the Biological Assessment for each species.

Gray Wolf

Implementation of the Forest Plan for the Superior National Forest **may affect, and is likely to adversely affect**, the Gray wolf.

Implementation of the Forest Plan for the Superior National Forest **may effect, but is not likely to adversely affect** designated critical habitat for Gray wolf.

Analysis for gray wolf and its designated critical habitat focused on;

1. Forested prey habitat for deer, moose and beaver (young upland forest and sapling/pole or older upland conifer forest and
2. Potential for human disturbances associated with human access (trails and roads).

Many aspects of the Forest Plan would not likely adversely affect wolves or would proactively benefit them – or have no effect. The overall determination of effect “may affect and likely to adversely affect” was based only based on the potential for adverse impacts from human access and disturbances such as illegal shooting, incidental trapping, and possibly unpredictable vehicle collisions.

Although Forest Plan protective management guidance strives to reduce the potential for adverse impacts, historical information and past experience indicates wolves are susceptible to harm from humans where access is provided into wolf habitat. Because the Forest Plan proposes and manages access on the Forest, there exists a potential for harm to wolves. In spite of this potential risk, and wolf depredation efforts (USDA 2010n), Forest Plan habitat and

access management direction continues to support a healthy wolf population in northern Minnesota, and any adverse impacts to individual wolves are not likely to impede the continued recovery of the species.

As per Section 7 of the Endangered Species Act the Forest has provided this Biological Assessment to the U.S. Fish and Wildlife Service, requesting consultation and a Biological Opinion on the determinations for the gray wolf.

All of the Superior National Forest is delineated as critical habitat for the gray wolf. Through proposed vegetation management and limitations on roads and trails, or other developments, the Forest Plan continues to promote the maintenance or development of space, food, and cover sufficient or greater than sufficient to assure adequate habitat for the survival of the gray wolf. Therefore, the implementation of the Forest Plan is not likely to adversely affect designated critical habitat.

As per Section 7 guidance, the Superior National Forest will seek a letter of concurrence from the U.S. Fish and Wildlife Service if they agree with this conclusion.

Canada Lynx

Implementation of the Forest Plan for the Superior National Forest **may affect, and is likely to adversely affect**, the Canada lynx.

Implementation of the Forest Plan for the Superior National Forest **may effect, but is not likely to adversely affect** designated critical habitat for Canada lynx.

Analysis for Canada lynx and its' designated critical habitat focused on;

1. Forage Habitat – forested prey habitat for snowshoe hare (upland and
2. Unsuitable Habitat – very young forest that does not provide for snowshoe hares.
3. Denning Habitat – mature and older forest (Denning habitat in patches greater than five acres)
4. Connectivity – the percentage of total forested lynx habitat that provides adequate cover
5. Human Disturbance – potential for human disturbances associated with human access (trails and roads).
6. Other Risk Factors – activities or programs not specifically proposed by the Forest Plan, rarely occur, are minor in extent and unlikely to have a measureable impact.
7. Crosswalk with Primary Constituent Elements of Critical Habitat – the Forest Plan direction that applies one or more of the Primary Constituent Elements.

The analysis for red squirrel (conifer forest with trees of cone-bearing ages) is not conducted in this BA. Research since 2004 has determined that red squirrel is not a key prey species as previously thought.

Many aspects of the Forest Plan would not likely adversely affect the lynx, or would proactively benefit the species, or have no effect. The overall determinations of effect **may affect, and is likely to adversely affect**, was based only on the potential for adverse impacts from human access and disturbance; primarily from illegal shooting and incidental trapping, and possibly unpredictable vehicle collisions. Vehicle collisions are a potential threat from human

access, although this would be unlikely on low-standard roads that are part of proposed and probable practices discussed in this biological assessment.

Although protective management guidance would reduce the potential for adverse impacts, some mortality or harm is likely during the planning period because Canada lynx are known to be susceptible to illegal shooting or incidental trapping due to their mannerisms and/or habitat use. In addition, conservation measures are still being tested for effectiveness over time. Because the Forest Plan increases access, there exists a potential for greater human access into lynx habitat and the possibility for either intentional or unintentional harm to lynx.

The majority of the Superior National Forest is delineated as critical habitat for the Canada lynx. Through proposed vegetation management and limitations on roads and trails, or other developments, the Forest Plan continues to promote the maintenance or development of space, food, and cover sufficient or greater than sufficient to assure adequate habitat for the survival of the Canada lynx and its' primary prey species the snowshoe hare. Therefore, the implementation of the Forest Plan is not likely to adversely affect designated critical habitat.

As per Section 7 of the Endangered Species Act the Forest has provided this Biological Assessment to the U.S. Fish and Wildlife Service, requesting consultation and a Biological Opinion for the Canada lynx if they agree with the determinations.

Future Project-level Planning

The Forest Plan is considered “programmatic”. It may promote and allow,

but generally does not require, specific actions on the ground. The Forest Plan is permissive and generally does not mandate projects in a specific location at a specific time.

Because of uncertainty associated with programmatic-level planning, this Biological Assessment takes a conservative approach in determining effects and acknowledges the potential for impacts, including negative impacts, where those impacts may be, in some cases, relatively low. However, because proactive management for species conservation and recovery is a high priority on National Forests, we also assume that potential negative impacts would be proactively addressed at the project-level when there is more certainty about timing, location, or intensity of projects. Management standards and guidelines for federally-listed species, successfully applied, may, in many cases, reduce or eliminate those potential negative impacts.

It is therefore, important to keep in mind that the determination of effects made in this Biological Assessment does not negate the need for project-level analysis and determinations. Project-level analysis and project design will consider much more specific information and incorporate standards and guidelines that may reduce or eliminate potential negative impacts. For this reason, project-level determinations may be different from determinations at the programmatic-level that are documented in this Biological Assessment.

Table A displays the expected effects to federally-listed species from the variety of proposed and probable practices of the Forest Plan. Unless otherwise noted, these are found in the Forest Plan' Appendix D, or Chapter2 – Forest-wide Management Direction: Objectives.

Table A: Summary of effects to federally-listed species from the variety of proposed and probable practices of the Forest Plan.								
PROPOSED and/or PROBABLE MANAGEMENT PROGRAMS AND ACTIVITIES: Based on Forest Plan Objectives	May Affect						No Effect	
	Not Likely to Adversely Affect				Likely to Adversely Affect			
	Completely Beneficial		Discountable Or Insignificant					
	Gray wolf	Canada Lynx	Gray wolf	Canada Lynx	Gray wolf	Canada Lynx	Gray wolf	Canada Lynx
Forest Vegetation Management: These activities may have direct impacts of causing disturbance during management activity or indirect impacts based on changes to vegetation conditions relevant to species’ required habitats (breeding, forage, security, and dispersal (connectivity) habitat, etc.)								
Watershed Health, Riparian Areas, and Soil Resources Management								
Restore the ecological integrity on all or parts of one or two of the Forests’ 5 th -Level watersheds per year by: enhancing or re-establishing natural ecological processes and diversity of riparian systems; improving road and trail crossings to assure soil stability, unimpeded flow, sediment transport, and/or passage of fish. (O-WS-2)							X	X
Within “near bank” riparian management zones, as part of all actions involving vegetation management, favor management for long-lived tree species (such as white pine, red pine, black spruce, tamarack, etc.) suitable for the site, at stand densities suitable for the site. (O-WS-3)							X	X
Within “remainder” riparian zones, as part of all actions involving vegetation management, favor management for extended rotation of tree species (either long-lived or short-lived) suitable for the site. (O-WS-5)							X	X
Reconstruct an average of one-half to three miles of stream channel per year to enable the flow of water and sediment to occur without resulting in a change in stream pattern, dimension and profile. (O-WS-6)							X	X
Increase the amount of forest cover that is age 16 or older on NFS land in 6 th -level watersheds where the total combined acreage in upland plus young (age <16) forest is above or approaching 60% of the total watershed area. (O-WS-8)							X	X
Insects, Diseases, and Disturbance Processes								
Increase the amount of forest restored to, or maintained in a healthy condition with reduced risk and damage from fires, insects, and diseases. (O-ID-1)			X	X				
Establish, maintain, or improve vegetative conditions using prescribed fire, mechanical treatments or other tools (O-ID-2), including burning for. (FEIS, Tables FIR-1 and 2).			X	X				
Ecological objectives in fire dependent ecosystems.			X	X				
Hazardous fuels reduction			X	X				

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Site preparation in clearcut or shelterwood cut harvest areas.			X	X				
Treat vegetation in high fire hazard areas within the Wildland Urban Interface to reduce risk from wildland fire (O-ID-3)			X	X				
Reduce fuels and control vegetation in understory of stands that have historically had natural occurring low-intensity fires. (O-ID-4)			X	X				
Vegetation Management								
Vegetation will move toward the long-term desired composition, structure, and spatial distribution, and within-stand diversity, where socially, economically, and ecologically suited to meet overall multiple-use desired conditions. (O-VG-1). (Measureable specific objectives by timeframe and within the ecological context of Landscape Ecosystems are found in the Landscape Ecosystem Objectives Section of the Revised Plan). Timber harvest (see Timber Management below) and natural vegetation succession will be the primary tools used to move toward objectives, but other tools may include prescribed fire (see Insects, Diseases, and Disturbance Processes above), and:			X	X				
Site preparation (mechanical, such as disking, chipping, brushing)			X	X				
Planting or seeding in harvest areas (in even-aged and uneven-aged harvests)			X	X				
Timber stand improvement			X	X				
Timber Management								
The Forest provides commercial wood for mills...and other uses. (O-TM-1) Expected practices are displayed in Appendix D: Probable Practices (of the Forest Plan) and include:			X	X				
Thinning			X	X				
Clearcutting			X	X				
Shelterwood and Partial Cut 30 Basal Area			X	X				
Uneven-aged management in red pine, white pine, spruce/balsam fir, northern hardwood, oak, black ash			X	X				
Uneven-aged management in aspen, birch, aspen-spruce/balsam fir.			X	X				

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Terrestrial and Aquatic Wildlife Management								
Move terrestrial and aquatic habitats in the direction of desired conditions and objectives for all native and desired non-native wildlife, or mitigate unavoidable adverse impacts. (O-WL-1)			X	X				
Maintain, protect, or improve habitat for all threatened and endangered by emphasizing and working toward the objectives of Federal recovery plans and management direction in this Plan. (O-WL-4)	X	X						
Seek opportunities to benefit threatened and endangered species from the spectrum of management activities on NFS land. (O-WL-5)	X	X						
Reduce or eliminate adverse impacts on threatened and endangered species from the spectrum of management activities on NFS land. (O-WL-6)	X	X						
Promote the conservation and recovery of Canada lynx and its habitat (O-WL-8)	X	X						
In LAUs on NFS land, manage vegetation to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternate prey in sufficient amounts and distributions so that availability of prey is not limiting lynx recovery. (O-WL-9)	X	X						
In LAUs on NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx (O-WL-10)	X	X						
Maintain and, where necessary and feasible, restore sufficient habitat connectivity (to reduce mortality related to roads) to allow lynx to disperse within and between LAUs on NFS land (O-WL-11) *See also Human Access section below.	X	X						
Promote the conservation and recovery of the gray wolf. Population goal minimum: 1250-1400. (O-WL-17).	X	X						
Increase the amount of white pine to amounts more representative of native plant communities by planting or naturally regenerating white pine trees in white pine forest types and in other upland deciduous, mixed, and conifer forest. This objective matches white pine objectives shown in Landscape Ecosystems Objectives Section. (O-WL-34).		X					X	

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Vegetation should move toward long-term desired conditions (composition, age, spatial distribution, within-stand or within-stream or lake diversity, ecological function) to provide desired amounts, quality, and distribution of management indicator habitats (MIH) and their associated species. (Landscape Ecosystem Objectives for MIHs)			X	X				
Scenic Resources Management								
Management activities will maintain the Forests’ scenic resource values by meeting Integrity Objectives (Table SC-1 and Figure SC-2). Areas that do not currently meet Scenic Integrity Objectives will be considered for scenic enhancement and rehabilitation. (O-SC-1)	X	X						
Human Access and Disturbance: Activities that may allow human access in gray wolf, or lynx habitat may cause disturbance or harm								
Terrestrial and Aquatic Wildlife Management								
Minimize building or upgrading of roads in areas that are important for threatened and endangered species habitat and for habitat connectivity (O-WL-7)	X	X						
Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs on NFS land. * (O-WL-11) * See also Vegetation Section above.	X	X						
Through partnerships with other agencies and landowners, participate in cooperative efforts to identify, map, and maintain or restore, where feasible, linkage areas that provide habitat connectivity sufficient to allow lynx to disperse between disjunct blocks of lynx habitat at larger landscape scales (for example, among National Forests in the Great Lakes region). (O-WL-12)	X	X						
Maintain or improve the natural competitive advantage of Canada lynx in deep snow conditions. Snow compacting activities (such as snowmobiling, snowshoeing, skiing, dog sledding) are planned and accommodated in areas best suited to the activity while maintaining large, interconnected areas of habitat with little or no snow-compacting recreational activities. (O-WL-13)	X	X						
Through coordination with other agencies, participate in cooperative efforts	X	X						

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to reduce, to the extent possible, the potential for lynx mortality related to highways and other roads within the proclamation boundary of the National Forest. (O-WL-14)								
Recreation – Dispersed recreation								
The Forest provides dispersed recreation facilities such as campsites and picnic sites generally for small groups. Dispersed recreation opportunities emphasize a remote recreation experience , have few or no facilities, and are often near bodies of water or along roads and trails where public use is low (D-REC-13). Probable new campsites; 10 new sites, routine maintenance 40 sites.			X	X				
Trails								
The Forest trail system provides a range of activities and experiences necessary to accommodate recreation uses while minimizing environmental and social impacts. (D-TRL-1)			X	X				
Recreation Motor Vehicles (RMV)								
A maximum of 90 additional ATV trail miles and 130 snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system. (O-RM-1)					X	X		
Water Access								
Associated recreational, subsistence, and commercial water uses at water access sites will enhance or maintain water quality, TES species, and viable populations of and other native aquatic plant and animal species, and desirable non-native species (O-RWA-1). Maximum new water access sites: 10 (S-RWA-1).			X	X				
Transportation System								
Estimated OML 1,2 and Temporary roads constructed (USDA 2004a - FEIS Appendix F)					X	X		
New roads built to access land for resource management will be primarily OML-1 or temporary and not intended for public motorized use. Temporary			X	X				

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roads will be obliterated after their use is completed. All newly constructed OML-1 roads will be effectively closed to motorized road and recreation vehicles following their use unless they are needed for other management objectives. (O-TS-3)								
Road and trail crossings of streams, wetlands, and riparian areas adjacent to lakes and streams will be minimized. (O-TS-4)							X	X
Hydrologic and riparian functions will be maintained or improved when roads or trails are constructed across wetlands. (O-TS-5)							X	X
Unneeded roads will be decommissioned and closed to motorized vehicles. Roads that are not necessary for long-term resource management are considered “unneeded”. (O-TS-7)	X	X						
The Forest will decommission approximately 80 miles of road. (O-TS-8)	X	X						
Special Uses								
Attempt to meet demand for special use activities when consistent with Plan direction and the proposed use cannot be accommodated on non-NFS land. (O-SU-2)			X	X				
Probable Special Use Permits for access (roads and trails) to non-NFS land.					X	X		
Source: Revised Plan – Chapter 2 and 3; Appendix D. Final EIS: Chapter 3 and Appendix F; and Planning Record.								

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Section 1.0 – Introduction to the Biological Assessment

This Biological Assessment (BA) documents the potential effects to the federally-listed (threatened) Canada Lynx (*Lynx canadensis*), Gray wolf (*Canis lupus*) and their critical habitat based on new information since the implementation of the Superior National Forest Plan (Forest Plan) of 2004. This BA addresses the designation of critical habitat on the Superior National Forest (aka Forest) for Canada lynx and addresses new information that has developed Canada lynx and Gray wolf since the implementation of the Forest Plan.

On August 9, 2007, the bald eagle (*Haliaeetus leucocephalus*) was removed from the federal list of threatened and endangered species. Bald eagles are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (Eagle Act). For five years after de-listing the bald eagle is a Regional Forester Sensitive Species for the Superior National Forest (Forest) and monitored.

This BA was prepared in compliance with the requirements of Forest Service Manual Directives sections 2670.31, 2670.5(3), and 2672.4, the Endangered Species Act of 1973 as amended, and the National Forest Management Act of 1976 (NFMA). This Biological Assessment (BA) is written to fulfill the obligation of the USDA Forest Service (USFS) to coordinate or consult with the USDI Fish and Wildlife Service (USFWS) as a requirement of NFMA, and the Consultation Agreement between the Forest and USFWS, Twin Cities Field Office.

This BA tiers to the Programmatic Biological Assessment for the revision of the Forest Plan (USDA 2004b). This BA compares and contrasts new information with the information in the 2004 BA. This includes existing and changed conditions for lynx habitat, existing Forest Plan direction and implementation effectiveness, and findings of new research since 2004.

In addition, new information since 2004, for gray wolf is reviewed to determine if assumptions and conclusions made in 2004 are still valid.

Information provided by the USDI Fish and Wildlife Service (USDI FWS 2010). Letter from Field Supervisor Tony Sullins (April 1, 2011) confirms the species and critical habitat that should be considered for projects conducted on the Superior National Forest:

- Canada lynx (*Lynx canadensis*) (threatened)
- Canada lynx critical habitat
- Gray wolf (*Canis lupus*) (threatened)
- Gray wolf critical habitat

1.1 - Purpose, Need, and Significant Issues

The purpose and need for the Biological Assessment (BA) is intended to document possible effects on federally-listed species by implementing the management direction of the Forest Plan. Potential negative effects are discussed in this assessment as related to the implementation of the Plan to date, based on management and mitigation direction incorporated into the Plan.

In addition, there is a need to address the designation of critical habitat on the SNF for Canada lynx, and new information for gray wolf. The significant issue relates to the potential need for change in current Forest Plan direction for the management of lynx and the species habitat. This is based on whether new information, for both species, that has been developed since the implementation of the Forest Plan, would result in a need for a change in Forest Plan direction.

The companion documents to this BA are 1) the Forest Plan Revision Final EIS with its effects analysis on all resources and social factors of the area, 2) the Revised Forest Plan, which established management direction and guidance of all natural resource activities for the planning cycle, and 3) the 2004 Biological Assessment containing the original data and analysis, determinations of effects, LCAS cross references, LAU maps, and model parameters used for lynx indicators.

1.2 - Proposed Action

The proposed action is to continue to manage the National Forest as directed by the Forest Land and Resource Management Plan. A review of the 2004 determinations for gray wolf and Canada lynx, as well as management results of the 2004 Forest Plan implementation to date, has been completed. This includes the comparison and contrasting of new information with; 1) the information in the 2004 BA, 2) modified Alternative E of the Forest Plan Revision EIS; 3) Forest projects that occurred between February 28, 2008 and February 24, 2009; and 4) new scientific and Forest management information since 2004. In addition, the determination of effects to Canada lynx, will factor in the designation of critical habitat for Canada lynx on February 25, 2009, and grey wolf based on changed and/or new best available information since 2004.

1.3 - Other Alternatives Considered

There are no other alternatives.

1.4 - Scope of the Analysis

Analysis in this Biological Assessment addresses the effectiveness of Forest Plan direction including objectives, standards, and guidelines (Chapter 2 and 3); and results from monitoring and evaluation (Chapter 4) to date; and probable impacts to lynx critical habitat by Forest programs and activities that have been authorized and guided by the Forest Plan between February 28, 2008 and since February 25, 2009 when lynx critical habitat was proposed and then designated, and the best available information describing reasonably foreseeable projects that have not been completed.

The 2004 Forest Plan is considered “programmatic” in that the Forest Plan allows, but generally does not require specific actions on the ground. The Forest Plan is permissive and generally does not mandate projects in specific locations at specific times. Therefore, the scope of analysis for this BA is not a substitute for project-level programs, activities and practices where more information is available for site-specific analyses and determinations of effects. The evaluations and determinations of effects in this BA are based on known and expected impacts of actions that have been approved for implementation in compliance with management direction, and are not specifically proposed, but are very probable.

The assessment of past, present and reasonably foreseeable probable impacts is evaluated by the review of Monitoring and Evaluation Reports since 2004, the model parameters used for Lynx indicators (Appendix D) (2004 Forest Plan BA) at the Lynx Analysis Unit (LAU) and designated lynx critical habitat scales, best available information describing reasonably foreseeable projects that have not been completed, and the findings of new research since 2004 for both lynx and grey wolf. For analysis purposes, Decade 1 begins January 1, 2005 with Decade 2 beginning on January 1, 2015. For analysis purposes Decade 1 begins January 1, 2005, with Decade 2 beginning January 1, 2015.

1.5 - Determination of Effect

To make a determination of whether the 2004 Forest Plan is likely to affect listed species or designated critical habitat the definitions for determinations of effect, given in the Section 7 consultations from the Endangered Species Consultation Handbook (USDI FWS and NMFS 1998), are used. In making the determinations in this BA the following conclusions were considered.

- **No Effect** – the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or its designated critical habitat.
- **May Effect** - the appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat. When the Federal agency proposing the action determines that a “may affect” situation exists, then they must either initiate formal consultation or seek written concurrence from the Fish and Wildlife Service that the action “is not likely to adversely affect” (see definition below) listed species.
- **Is likely to adversely affect** – the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or independent actions, and the effect is not: discountable, insignificant, or interdependent actions, or beneficial. In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action “is likely to adversely affect” the listed species. If incidental take is anticipated to occur as a result of the proposed action, then an “is likely to adversely affect” determination should be made. An “is likely to adversely affect” determination requires the initiation of formal section 7 consultation.

- **Is not likely to adversely affect** – the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species. **Insignificant effects** relate to the size of the impact and should never reach the scale where take occurs. **Discountable effects** are those extremely unlikely to occur. Based on best professional judgment, a person would not: 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur.

For reference, effects of the action are defined in the Section 7 Consultation Handbook (USDI FWS and NMFS 1998) as;

- **Effects of the Action** – the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or independent with that action. These effects are considered along with the overall effects to the species for purposes of preparing a biological opinion on the proposed action.

1.6 - Consultation with USDI Fish and Wildlife Service

The Forest Service has initiated consultation with the Fish and Wildlife Service seeking concurrence with the determination of effects in this BA, which concludes that the continued Forest Plan implementation would have the following effects to federally-listed species and critical habitat:

Gray wolf: *Likely to Adversely Affect* (LAA), and *Not Likely to Adversely Affect Critical Habitat* (NLAA)

Canada lynx: *Likely to Adversely Affect* (LAA), and *Not Likely to Adversely Affect Critical Habitat* (NLAA)

The history of the programmatic consultation that was undertaken for the 2004 Forest Plan revision is documented in the Programmatic Biological Assessment for the revision of the Superior and Chippewa National Forest Plans (USDA 2004, pp. 6-7). The relevance of program-level consultation to this BA includes the agreement between the Forest Service and the U.S Fish and Wildlife Service reached on defining elements of species' ecology and biology, risk factors and general effects, analysis parameters, monitoring, and management direction in the revised Forest Plan. The 2004 BA provided more specific information on how relevant information was incorporated into the Forest Plan. Additionally, other factors relevant to this BA and not discussed in detail will be discussed in detail in subsequent project-level consultations.

Although the 2004 Forest Plan Programmatic BA consultation or conference on Canada lynx proposed or designated critical habitat occurred prior to proposed designation in February 25, 2008 (USDI Fish and Wildlife Service 2008), most of the risk factors to lynx that were analyzed in 2004 also addressed the primary constituent elements of proposed critical habitat. Therefore the 2004 Programmatic BA also has relevance to proposed critical habitat as it does to lynx itself. See **Section 3.0** for additional information on critical habitat.

Consultation information and data specific to this BA is documented in the project file. It includes emails, telephone calls, and meeting notes between July, 2010 and the submission of the BA to the USFWS.

1.7 - Handling of Live and Dead Threatened or Endangered Species

There is no change from the 2004 BA with the exception that Bald Eagles are no longer federally-listed. Reference Appendix C for the most recent regulations.

Section 2.0 - Gray Wolf

2.1 - Background

The species was listed as “endangered” by the Department of Interior in 1967. Wolves were officially protected in 1974 under the federal Endangered Species Act of 1973. Minnesota outlawed taking in 1974. In 1978 the gray wolf was reclassified as “threatened” in Minnesota (Eastern Timber Wolf Recovery Plan [Revision] 1992). In 2003, the gray wolf was reclassified to “threatened” in the remainder of the Eastern distinct population segment (USDI 2003), but that designation was overturned in federal court in 2005. Since 2003, the status of the gray wolf under the Endangered Species Act has been subject to several regulatory changes and resulting litigation in numerous federal courts. The gray wolf remains a threatened species in Minnesota pursuant to the Endangered Species Act.

Success in achieving recovery goals set in the 1992 Recovery Plan set the stage for delisting of the wolf in Minnesota. If delisted, management authority would be assumed by the state of Minnesota and to tribes. In anticipation of delisting, the 2000 Minnesota Legislature passed a wolf management bill that was signed into law by the governor. The Minnesota Wolf Management Plan of 2001 (MNDNR 2001) is based on the authorization of this law.

Key documents guiding gray wolf conservation on National Forest land

On National Forests in Minnesota conservation management for the gray wolf is guided by four key documents:

1. Eastern Timber Wolf Recovery Plan 1978 (USDI 1978). This is the original recovery plan provided by the FWS. It provides the basis for management guidance and population goals identified in the current Forest Plans. The original recovery plan of 1978 established five management zones with differing management/population strategies. This guidance is intended to “maintain, enhance and recover the gray wolf in as much of its present and former range as feasible.”

2. Eastern Timber Wolf Recovery Plan 1992 (USDI 1992). This recovery plan revised the 1978 plan. Region 3 of the US Fish and Wildlife Service approved the revision in 1992. The revised plan continued the five Management Zones established in the original recovery plan, but these were never officially implemented with the proposed changes to their boundaries. The Superior is predominantly in Zones 1 and 2; the Chippewa is in Zone 4 (. Zone 1 has no population goals, but wolves are expected to fluctuate with exigent welfare and decimating factors. Zones 2 and 3 have a goal of 1 wolf per 10 square miles, and Zone 4 is 1 wolf per 50 square miles. The 1992 Recovery Plan describes an estimated population goal for Minnesota as 1,251 to 1,400 wolves by year 2000. The 1992 Recovery Plan also called for road density of high standard roads to remain below one mile per square mile in Zones 1, 2, and 3.

Recovery will be achieved when: (1) the survival of the wolf in Minnesota is assured; and (2) at least one viable population of the gray wolf outside of Minnesota and Isle Royal in the contiguous 48 states is re-established and remains viable for at least five consecutive years. A viable (healthy, self-sustaining) population is defined as 100 interbreeding wolves. A Wisconsin-Michigan population of 100 wolves is considered to be a viable second population, because emigration from Minnesota will supplement it numerically and genetically for the foreseeable future. The assurance of wolf survival in Minnesota assumes that (1) the provisions of this Plan for the Minnesota wolf population will be kept in effect subsequent to delisting, and that (2) protection of essential areas or critical habitat (Zones 1, 2, and 3 in Minnesota) is assured.

3a. Revised Land and Resource Management Plan (Forest Plan) – Chippewa National Forest,: Gray Wolf (USDA 2004).

3b. Revised Land and Resource Management Plan (Forest Plan) – Superior National Forest, Gray Wolf (USDA FS 2004).

4. Biological Opinion on the Revised Land and Resource Management Plan (Forest Plan) – Chippewa and Superior National Forests (US Fish and Wildlife Service July 15, 2004).

During implementation of the Revised Forest Plans, additional applicable and more current information on wolves has also been considered and applied, under the direction of the key documents listed above.

2.2 - Critical Habitat

Critical habitat is defined, in part, as: "...specific areas within the geographical area occupied by the species...on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection (USDI 1998, p. xii-xiii). In 1978, the U.S. Fish and Wildlife Service published a final rule "Reclassification of the Gray Wolf in the U.S. and Mexico with Determination of Critical Habitat in Michigan and Minnesota" (43 FR 9607 9615). The 1978 Final Rule is still in effect.

Within critical habitat, the Recovery Plan emphasizes the need for space (for growth and movement of packs), food, and cover sufficient to assure the survival of gray wolves (USDI

1992). Specifically, the Plan encourages management activities that maintain or develop these factors in critical habitat and minimize activities that would permanently remove forest cover, such as road construction and human development.

In Minnesota, Wolf Management Zones 1, 2 and 3 are considered critical habitat for the survival and recovery of the gray wolf. In the original 1978 Recovery Plan critical habitat was designated on portions of the Superior National Forest only; the Chippewa National Forest had Zone 4 only (USDI 1992, p. 72). The Recovery Plan of 1992 (USDI 1992) proposed changes to the management zones boundaries established in the original recovery plan, however these changes were never implemented. The 1978 Final Rule for wolf critical habitat (43 FR 9607 9615) is still in effect.

2.3 - Gray Wolf Ecology

The Forest Service collected and solicited applicable scientific information (both current and historical) and expert opinions about wolf ecology, occurrences, and management impacts on the National Forests primarily through a species literature review (Route 1999) and a species expert panel held in January 2000 (USDA FS 2002).

The literature review or “Gray Wolf Data Record” prepared by Route (1999) provides a review of pertinent literature and provided us with applicable and current information on wolf habitat needs, biology, population, landscape structure, risk factors, as well as management impacts of the Superior National Forest Revised Plan, and potential mitigations. With this reference available, we will only include a summary of information on wolf ecology to provide backdrop to the analysis parameters. Unless noted, Route (1999) is the reference for the information in these sections (3.3, 3.4, 3.5, 3.6) below. Literature published since Route (1999) was also reviewed (Section 5, USFWS 2011) and applicable information is included below.

A recent review of Gray wolf taxonomy in Minnesota and the Great Lakes Region of North America concluded that the Minnesota population currently consists of a gray wolf (*Canis lupus*), eastern type (*Canis lupus lycaon* or *C. lycaon*), and hybrids of the two (Mech 2010), although the taxonomic identity continues to be controversial (e.g. Cronin & Mech 2009; Koblmuller et al. 2009a; Koblmuller et al. 2009b; Kyle et al. 2006; Mech 2010; Nowak 2002; Schwartz & Vucetich 2009)

Wolves live in family groups referred to as “packs”. Size of wolf packs can range from 2 to 30 individuals though approximately 15% (range 5 to 29%) of the population may be composed of loaners or dispersers at any time (Fuller 1989). Packs are usually composed of a breeding (alpha) pair with their offspring from recent litters (Mech 1999). Studies have shown, however, that there is considerable genetic linkage between packs and diversity within packs suggesting unrelated wolves join packs not infrequently (Meier et al 1995). In Minnesota, the average pack size ranges between 4.9 and 5.6, according to surveys conducted between 1988 and 2008 (Erb & Benson 2004, Erb 2008). The average pack size in Wisconsin is 4.5 wolves per pack (Wydeven et al. 2006).

Wolf pack territory size in the Great Lakes region ranges from 42 to 100 square miles, but territories as large as 200 square miles have been reported (see Fuller 1989). Recent surveys show that wolf territory size in Minnesota averages from 39 to 40 square miles (Erb 2008, Erb and Benson 2004). Territories rarely overlap and are defended against other wolves (Peters and Mech 1975). Dispersal generally occurs between October and January when yearlings seek a mate and their own territory. Dispersal movements may be large in nature, covering upwards of 500 miles or more.

Wolves are sexually mature at 22 months but generally only the alpha pair breed (Mech 1970). The alpha pair normally inhibits sexual contact between other mature members. Breeding takes place from January through March, and gestation is 60-63 days. Pups (4-8) are born in early to mid-April (Fuller 1989). Pups remain at the den site for 6 to 8 weeks. Throughout the summer, wolves utilize 2-3 rendezvous sites (Fuller 1995). In September, when the pups are large enough to travel with the pack, rendezvous sites are abandoned and the pack moves as a single unit.

Wolves are susceptible to disease, predation, human persecution, starvation, and accidents. Survival of pups in summer is difficult to estimate but has ranged from 0.48 to 0.89 (see summary in Fuller 1997:6). Survival of pups is likely related to prey biomass (Fuller 1989). Survival of yearlings and adults in the Great Lakes region has varied from 0.61 to 0.82 (Fuller 1989; Gogan et al. 2004; Wydeven et al. 1995).

Disease such as canine distemper, canine parvovirus (CPV), Lyme disease, mange and blastomycosis have been observed in Minnesota wolves. However, the usual high annual replacement of dying wolves by a high number of pups produced (Mech 1977 in Mech 2002) may be attenuated by CPV mortality of young pups (Mech and Goyal 1995 in Mech 2002). On the Superior National Forest wolf population density stable or increasing for many years probably indicating that the main effect of CPV is to reduce the number of dispersing wolves (Mech 2002).

Potential and favorable wolf habitat is defined by several elements such as low human population density, sufficient prey density, road density, vegetation cover and special landscape patterns (Mladenoff et al. 1995, 1997). Gray wolves are generalists that can live in most any habitat that supports ungulate prey. Wolf densities are directly related to the densities of their primary ungulate prey (Fuller 1989) thus forested areas occupied by white-tailed deer and moose are critical. Additionally, the habitat should be suitable for smaller prey such as beaver and snowshoe hare which may be seasonally important (Mech 1970). Moose, deer, and snowshoe hare tend to forage in areas of regenerating upland forest, and conifer forest is an important component of thermal cover for all. Riparian aspen forest is important for beavers. Patch structure is only important in that it may alter prey densities or include areas of high road and human densities thereby indirectly altering wolf distribution (Fuller 1997).

In Wisconsin, Mladenoff et al. (1995, 1999) provided that re-colonizing wolf packs selected territories that contained no urban land, very little farmland, and that were 93% forested. Road density was the best predictor of suitable habitat for breeding packs (Thiel 1985; Mech et al. 1988; Mladenoff et al. 1995). While wolves will use roads and readily cross them, generally, areas with road densities of <1 mile/mile² are best for wolf survival (see discussion in Fuller 1997, Wydeven 2001).

2.4 Population Status

2.4.1 North America and Minnesota

Wolves once occupied all of North America, and today occupy only between five and ten percent of this historic range. The wolves occupying Minnesota are part of a meta-population of 60,000 to 80,000 covering most of Canada; the Lake States of Minnesota, Wisconsin, and Michigan; portions of the northern Rocky Mountains; with smaller reintroduced populations in Wyoming (Yellowstone National Park), central Idaho, and Arizona/New Mexico. Recent surveys show that there are about 2,921 wolves in Minnesota (Erb 2008), 626 in Wisconsin (Wydeven and Wiedenhof 2009), and 580 in Michigan's Upper Peninsula (Roell et al. 2009). The wolf population of Isle Royale National Park, Michigan, consisted of 24 wolves during 2008-2009 winter surveys (Vucetich and Peterson 2009). Their Minnesota range is predominantly in the northern-forested zone, defined by the Terrestrial Ecological Unit Inventory as the Laurentian Mixed Forest Province. The Northern Minnesota Drift and Lake Plains Section in which the Chippewa National Forest is located and the Northern Superior Uplands Section in which the Superior National Forest is located form about two thirds of this Province.

There has been a gradual, long-term increase in wolves in Minnesota. A 1997-1998 winter survey conducted by the Minnesota DNR estimated that 2,445 wolves (90% confidence interval of 1,995 to 2,905) existed in about 385 packs in Minnesota (Berg and Benson 1998). This data indicates that the number of wolves in Minnesota had grown at an average rate of 3.7 percent annually from 1970 through 1997-1998 (Berg and Benson 1998, Fuller et al. 1992). The Minnesota DNR conducted two surveys since then, and concluded that 3,020 wolves (90% confidence interval of 2,301 to 3,708) in 485 packs occurred in Minnesota during the winter of 2003-2004 (Erb and Benson 2004) and 2,921 wolves (90% confidence interval of 2,192 to 3,525) in 503 packs occurred in Minnesota during the winter of 2007-2008 (Erb 2008). The results of the most recent three surveys (1997-2008) suggest that the wolf population has been numerically stable from 1998 to 2008 (Erb 2008).

As wolves increased in abundance in Minnesota, they also expanded their distribution. During 1948-53, the major wolf range was estimated to be about 11,954 square miles (Stenlund 1955), which is approximately 14 percent of the state. Minnesota DNR surveys from 1997-1999 estimated a wolf range of over 28,541 mi² in Minnesota (MN DNR 2001a). As of 2003-2004, wolf range in Minnesota may have stabilized and now covers about 40 percent of the state (Erb 2008; Erb & Benson 2004). Based on the total occupied range in Minnesota of 27,612 mi² and the current estimate of 2,921 wolves range-wide density would average one wolf to about 10 mi² (1/30 km²) (Erb 2008).

Increases in the State-wide population are due to federal and State protection and high prey densities. Causes of wolf mortality include disease, predation and those of human-related origin.

Parasites and disease may have impacts to wolf populations in Minnesota, either through direct mortality of individuals or reduced longevity and fecundity of individuals or entire packs.

Wolves in Minnesota may have been exposed to canine parvovirus as early as 1973 (Mech & Goyal 1993; Mech & Goyal 1995). The population impacts of canine parvovirus are believed to be via diarrhea-induced dehydration leading to abnormally high pup mortality (WI DNR 1999). Despite the presence of canine parvovirus, wolf abundance and range in Minnesota have stabilized above recovery goal levels and there is no evidence that canine parvovirus has caused a population decline in the Minnesota wolf population. In the Superior National Forest, Mech and Goyal (1995) found high canine parvovirus prevalence during the same years in which wolf pup numbers were low, however they concluded that these pup mortalities only replaced deaths that would have occurred from other causes, particularly starvation. Mech and Goyal (1995) theorized that CPV prevalence would cause a wolf population decline when 76 percent of the adult wolves consistently test positive for CPV exposure. Their data indicate that CPV prevalence in adult wolves in their study area increased by an annual average of 4 percent during 1979–93 and was at least 80 percent during the last 5 years of their study (Mech and Goyal 1995). Data collected since 1995 suggests that canine parvovirus has reduced pup survival both in the Superior National Forest and throughout Minnesota, between 1984 and 2004. There is evidence of a slight increase in pup survival in Minnesota since about 1995 (Mech et al. 2008).

Sarcoptic mange exists in Minnesota wolves and is recognized as a continuing issue affecting wolves (Shelley & Gehring 2002). In Minnesota, mange has likely been present at low levels and may currently infect less than 10 percent of the wolves in the state (Hart 2009, pers. comm.).

Other causes of wolf mortality include illegal killings, legal wolf depredation control and accidental human related mortality (e.g. road kill). Wolf mortality is further discussed in section 2.4.4.

Even with these diseases, predation and human-related mortality, wolf numbers in Minnesota have increased since it has been listed under the Endangered Species Act, and have remained stable over the past ten years.

2.4.2 Superior National Forest

The wolf population is variable but generally stable on the Superior National Forest in Minnesota (Mech and Karns 1977; Berg 1986; Berg and Benson 1998).

Studies have estimated that the wolf population on the Superior NF has averaged about 1 wolf per 14 – 15 mi² (Mech 2000, Lindquist 2002). An aerial survey of radioed and non-radioed wolf packs in a 795 mi² (2,060 km²) area of the central Superior National Forest in winter 2003-04 estimated that about 62 wolves were present, or 7 wolves per 100 square miles (3.0/100km²) (Mech 2004). Using the same methodology during the winter of 2007-08, the aerial survey estimated that approximately 82 wolves were present in a 795 mi² (2,060 km²) area of the central Superior National Forest, or about 1 wolf for every 10 mi² (4.0/km²) (Mech 2008). This density estimate is the same as estimates from similar winter 2005-2006 surveys (Mech 2006) and is the highest wolf population recorded in the study area since 1971 (Mech 1973, 1986, 2008). Assuming that wolf density is similar to the 2007-2008 density estimates throughout the forest, which covers approximately 4688 square miles (12,141 square kilometers), there were

approximately 484 wolves on the Superior National Forest in 2008 (see emails 8/13/2009 S. Catton-USFS and P. Delphey-USFWS)

The population on the Superior NF may be higher today than previous to 1900. Wolf density is directly related to the density of ungulates, their primary prey. Moose (*Alces alces*) and woodland caribou (*Rangifer tarandus caribou*) were the dominant ungulate species in northeast Minnesota, before European settlement, around the turn of the 20th century. Today white-tailed deer (*Odocoileus virginianus*) have replaced caribou and occur at higher densities than caribou occurred. Beaver (*Castor canadensis*) are also major prey, seasonally important, and occur throughout the Superior NF.

2.4.3 Population Goals in Minnesota

The Wolf Recovery Plan of 1992 (USDI 1992) proposed changes to the management zones boundaries established in the original recovery plan; however these changes were never implemented. The 1978 Final Rule for wolf critical habitat (43 FR 9607 9615) is still in effect.

The Superior is predominantly Zones 1 and 2. The 1992 Recovery Plan sets the population goal for Minnesota as 1,251 to 1,400 wolves by year 2000. This includes the following zone goals for population density:

- Zone 1:** no population goals, but wolves are expected to fluctuate with exigent welfare and decimating factors.
- Zone 2:** 1 wolf per 10 square miles
- Zone 3:** 1 wolf per 10 square miles
- Zone 4:** 1 wolf per 50 square miles.

2.4.4 Summary of Wolf Mortality in Minnesota

USDA APHIS Wildlife Services (WS) maintains records on the legal taking of wolves in Minnesota. From 1996 to 2009, an average of 146 wolves (with a 95 percent confidence interval of 132 to 159) has been taken annually as a result of depredation control in Minnesota (Hart 2010, pers. comm. USDA – Wildlife Services).

Illegal mortality can often be estimated through radio-telemetry studies (Fuller 1989), however only a few radio-telemetry studies have taken place in Minnesota. North-central Minnesota data from 16 diagnosed mortalities of radio-collared wolves over a 12-year period (1994-2005) show that human-causes resulted in 69 percent of the diagnosed mortalities. This includes 1 wolf accidentally snared, 2 vehicle collisions, and 8 (50 percent of all diagnosed mortalities) that were shot (DeGiudice.2005). A smaller mortality dataset is available from a 1987–1991 study of wolves in and adjacent to Minnesota’s Voyageurs National Park, along the Canadian border. This radio telemetry study found that all mortality inside the park was due to natural causes (for example, killing by other wolves or starvation), whereas the majority (60-80 percent) of mortality outside the park was human-induced (for example, shooting and trapping) (Gogan et al. 2004).

The United States Fish and Wildlife Service (USFWS) obtains mortality data from USDA Wildlife Services (Table Wolf-1) and other researchers, but does not create annual summary reports of wolf take in Minnesota (Phil Delphey, pers. comm., November 2010).

Table Wolf -1: USDA-Wildlife-APHIS-Services depredation data (Hart 2010, pers. com. USDA – Wildlife Services).			
Year	Gray Wolves Legally Killed in Minnesota	Wolves Captured and Not Killed	Total Wolves Captured
1979	6	9	15
1980	21	5	26
1981	29	13	42
1982	20	4	24
1983	42	7	49
1984	36	11	47
1985	31	5	36
1986	31	0	31
1987	43	2	45
1988	59	5	64
1989	81	14	95
1990	91	0	91
1991	54	9	63
1992	118	4	122
1993	139	14	153
1994	172	3	175
1995	78	0	78
1996	154	13	167
1997	216	11	227
1998	161	5	166
1999	151	12	163
2000	148	5	153
2001	109	5	114
2002	146	17	163
2003	125	4	129
2004	105	10	115
2005	134	14	148
2006	122	9	131
2007	133	0	133
2008	143	0	143
2009	195	4	199
Average (1996-2009)	146	8	154
Standard Deviation	30		

2.5 Factors Affecting Gray Wolf Environment and Analysis Indicators

The Recovery Plan for the Eastern Timber Wolf (USDI 1992) and the Minnesota Wolf Management Plan (MN DNR 200) identify habitat factors considered as essential for a recovering and recovered wolf population (including maintenance or improvement of critical habitat). Those within the purview of the Forest Service and that may be affected by implementation of the Revised Plan are discussed below. These factors are expressed under two main categories:

1. Prey habitat
2. Human access

The indicators identified below are used to compare whether or not, and to what degree the Superior National Forest Revised Plan affect key habitat factors for the wolf.

2.5.1 Prey Habitat

Wolves are habitat generalists. Type, age, and structure of vegetation do not directly affect their distribution. However, in their northern Minnesota range, both within and outside of critical habitat, vegetation condition is important to their primary prey species: moose, white-tailed deer, and beaver.

Moose and Deer Habitat

Recovery plans discuss habitat management for wolf prey. The 1992 Federal Recovery Plan emphasizes increasing deer and moose populations. The 2001 State of Minnesota wolf plan does not emphasize increasing deer, but promotes maintaining “healthy populations” of these species. Rather than promoting high deer and moose populations for wolf alone, goals are designed to balance a variety of factors, including compatibility with habitats and ecosystems, sustainable harvests for hunters, observation opportunities (aesthetics), and conflicts with humans such as vehicle accidents and crop damage.

Statistics in the State Plan show that wolves do not suppress deer populations on a landscape scale. The Minnesota DNR expects current management prescriptions will continue to be sufficient to provide prey for wolves and hunting opportunities for humans (MN DNR 2001). Moreover, governing ungulate densities through habitat manipulation alone is not feasible.

Vegetation manipulation implemented by the Superior National Forest Revised Plan could affect the potential moose and deer populations in broad patterns, depending on such factors as location on the Forest, general soil productivity, the incidence of brain worm (*Parelaphostrongylus tenuis*), health of the herd and whether an area has long been an area favoring higher densities of moose or of deer. Mining activities in northern Minnesota remove moose and deer habitat when mines are excavated and processing plants built. But the loss of prey habitat in these areas off National Forest lands have not reduced available prey or affected wolf populations in northern Minnesota.

Beaver Habitat

Beaver habitat can be affected by riparian forest habitat conditions. Special riparian management would be applied to the functional riparian area of lakes and streams. See the Riparian and Fish Management section of the Final EIS, Chapter 3.6.2. Riparian areas are divided into two zones, the “near bank”, usually a 100 ft distance from the shore, and the “remainder zone”, or the remainder of the functional area of the riparian zone. The default remainder zone is 100 to 200 ft. The Objectives, Standards, and Guidelines of Revised Superior National Forest Plan directs management for a diversity of trees, long-lived species, a predominance of shade, a continual supply of larger wood debris, and more conifer.

The proposed forest management for the riparian zone, without assuming any other overt attempt to alter riparian habitat for specific reasons, can provide different potential habitat for beavers. Therefore, for Indicator 1 beaver habitat can also be analyzed with deer and moose.

Indicators Selected to Address (3.5.1) Prey Habitat:

Indicator 1: Acres and percent of young upland forest < 10 years old

This indicator represents potential forage afforded moose, deer, and beaver by acres of young, upland forest expected by implementation of the Revised Plan. Acreage dedicated to conifer plantations, clear cuts, areas of prescribed burns, and shelterwood harvests all provide significant forage biomass. Lowland conifer is not included. Even though the correlation between habitat and populations appears to be weak, this indicator will provide an overall analysis of potential prey forage habitat. Distribution of this forage habitat across the landscape will need to be analyzed at the project level.

Indicator 2: Acres and percent of upland conifer (spruce and pine) >9 years old on all uplands.

This indicator represents potential winter (thermal) and hiding cover for deer and moose provided by relatively dense occurrence of conifer in planted/seeded stands. Conifer also provides important summer thermal cover (from heat) for moose. Limitations of this indicator are the same as those discussed above for Indicator 1.

Climate Change

The 2004 BA did not specifically address the potential impacts of climate change to wolves and did not specify climate change in its list of risk factors. However, if climate change impacts northern Minnesota vegetation conditions impacts to wolf and critical habitat may occur based on potential beneficial impacts to white-tailed deer, its primary prey species. For example, boreal forest and the deep snow conditions and other boreal ecosystem flora and fauna could move north into Canada and disappear from the Superior National Forest. While white-tailed deer are numerous in Northern Minnesota this may improve habitat conditions for white-tailed deer since hardwood forests may be more productive for white-tailed deer.

The potential implications of climate change to northern Minnesota are difficult to predict but continue to be studied as follows. Galatowitsch et al. (2009) discussed potential habitat change scenarios in Minnesota based on an assessment of climate change projections from 16 models with varying scale and intensity. Galatowitsch et al. (2009) predicts that climate effects to Minnesota forests may include warmer summers and more frequent droughts, with an eventual disappearance of the boreal biome. However, none of these potential projections for northern Minnesota have the potential to occur for several decades or to 2100 (Galatowitsch et al. 2009, Frelich 2010 pers., comm.) which is well outside the current Forest planning cycle. There is also uncertainty as to which of these projections may come to pass over time. In the next Forest Plan revision, which will occur between 2015 and 2020 time period, relevant Range of Variability (RNV) science is anticipated to be reviewed and incorporated into Forest Plan direction. How this affects wolf critical habitat management is undetermined at this time.

At the Superior National Forest level how Forest management activities affect climate change are being studied (USDA 2011c). Starting 2010 the Superior National Forest funded an ongoing Climate Change ARRA (American Renewal and Recovery Act) project conducted by the Northern Research Station (NRS) and University of Minnesota. These preliminary results focused on carbon storage over a 100-year period.

1. Timber harvest is not making a big difference in total carbon storage. For all harvest scenarios evaluated in their carbon storage model (No harvest, 40%, 60%, and 100% of Forest Plan implementation), there is not much difference in total carbon storage, particularly between 60% of implementation (where we are now) and full implementation.
2. A minor change in natural disturbance rates (from 1 to 3%) creates a larger effect than harvest and has the potential to overwhelm management impacts on forest carbon.
3. Results suggest that maintaining or increasing forest-wide carbon stocks will be very challenging based on uncertainty of disturbance rates.
4. Across all eight forest types, the majority of carbon storage occurred in soil organic matter.
5. A minor change in natural disturbance rates creates a larger effect than harvest.
6. Aspen forests store less carbon than other forest types.

The next steps in this ongoing study include:

1. Factor in carbon sequestration or CO₂ uptake with their carbon storage data and model the carbon budget for the SNF. Younger actively growing forests have greater sequestration rates than older forests.
2. Display carbon budget differences (if any) in 20-year increments rather than just 100-year intervals.
3. Continuing field data collection in 2011 to fine tune model inputs.

Galatowitsch et al. 2009 discussed that ecological assessments are a productive first step in effective climate change planning. Like in the 2004 BA, for analysis purposes this BA assumes that current wolf habitat conditions will persist through the remainder of the Forest Planning cycle. While the 2004 BA did not analyze climate change, the Superior Forest Plan provides the direction in Chapter 2 – Forest-wide Management Direction, Chapter 3 – Management Area

Direction, and in Chapter 2 – Landscape Ecosystem Objectives for the Northern Superior Uplands Landscape Ecosystems (pgs 2-55 through 2-78). This combined direction drives the assessment of projects through mid-level analyses and smaller scale analyses. Through these assessments and subsequent implementation of vegetation management projects the Superior National Forest would maintain and protect the resistance, resilience and redundancy of wolf and critical habitat during the Forest planning cycle.

2.5.2 Human Access

Human settlement and roads have been considered major determinants in wolf distribution. They have multiple effects (described in greater detail in the Recovery Plan and the State plan), including:

- increased human presence with increased chance of direct killing (both legal and illegal)
- increased chance of introducing new diseases and parasites to wolves via pets
- possible deterrence to colonization of otherwise suitable habitat (including barriers to dispersal)

The Recovery Plan provides guidance on mitigating the potential negative impacts of human development and roads through road density guidelines. These are directed at permanent roads requiring routine maintenance that are accessible year-round by two-wheeled drive vehicles. Human development and road density thresholds were based on the association of the residual wolf populations with remote, densely forested areas, and the assumption that transportation development could deter dispersing wolves (Mech et al. 1993).

High Standard Roads (OML 3, 4, and 5)

Since at least 1985, 0.9 to 1 mile of road per square mile of land area has been suggested as a maximum threshold for wolf viability in an area (Thiel 1985, Jensen et al. 1986, Mech et al. 1988, Fuller, et al. 1988). Included are roads open year around to public use and passable by 2-wheeled drive vehicles. The Forest Service classifies these roads with an Operational Maintenance Level (OML) 3, 4 or 5. The 1992 Recovery Plan called for road density of these types of roads to remain below one mile per square mile in Zones 1, 2, and 3.

This road density threshold has been questioned given the current wolf population and distribution. By 1995, Fuller concluded the “roads and human population densities are only indices to the amount of human activity in an area and do not reflect the changes over time in human attitudes or in law enforcement activities”. In Minnesota, according to Berg and Benson (1998), the wolf population increased 50% from 1988 to 1998. The contiguous pack range increased by 48% and the occupied areas within the range increased 45% during that time. It seems that essentially all suitable habitat in Minnesota is now occupied, range expansion has slowed or possibly ceased, and the wolf population within Minnesota has apparently stabilized (Erb and Benson 2004; Erb and Carlos 2009).

The Minnesota DNR uses a combination of road density and human density to model suitable habitat for wolves (Erb and Benson 2004). Areas are deemed suitable for wolves if the road

density is less than 0.5 km per sq km and a human density is less than 8 per sq kilometer (0.19 mi per mi sq./3 per mi sq.), or if road density is less than 0.7 km per sq km with a human density of less than 4 per sq km (0.27 mi per mi sq./1.5 per mi sq.) (Erb and Benson 2004).

Wolves can be expected to expand their range into areas with more roads and humans, “as more tolerant attitudes toward wolves increase and depredations by wolves are controlled”. “Given the current status of wolves, reducing current levels of high standard road access is not necessary to increase either wolf density or distribution. However, in areas of sufficient size to sustain one or more wolf packs, land managers should be cautious about adding new road access that could exceed a density of 1 mi./sq. mi. without considering the potential effect on wolves”(MN DNR 2001). This appears to support one of the main points of the federal Recovery Plan: the focus can be on maintaining large blocks of habitat relatively free of human access even in extensive areas where, generally, the road density exceeds one mile per square mile.

The Superior Forest Plan continues to follow the density guideline in the wolf Recovery Plan: a maximum of 1 mile per square mile of OML 3, 4, 5 on all ownerships in Management Zones 1, 2, and 3.

Existing road density of high standard (OML 3, 4, and 5) roads is shown below. Density on the National Forests is calculated for roads of all jurisdictions equating to OML 3, 4, and 5 within mapped Lynx Analysis Units (LAUs) (Source: 2010 data).

Superior NF: 1,333 miles OML 3, 4, 5 on all jurisdictions within LAUs = 0.45 mi/mi² (outside the BWCAW)

Indicators Selected to Address (3.5.2) Human Access: High Standard Roads (OML 3, 4, and 5): NONE

This factor was not selected as an indicator because:

- The Revised Plan follows the density guideline in the wolf Recovery Plan: a maximum of 1 mile per square mile of OML 3, 4, 5 on all ownerships in Management Zones 1, 2, and 3.
- The Revised Plan does not propose adding more high standard roads to the road systems on the Superior National Forest, so road densities would not change.
- The Superior density of 0.45 miles/square mile (within LAUs) is meeting the federal Recovery Plan recommendation to maintain these types of roads at <1 mi./sq. mi., and with no addition of high standard roads proposed in the Plan, it would stay well below the recommendation.
- If a new high standard road is proposed this factor will need to be analyzed at a project level.

Refer to the 2004 planning record for a more detailed Roads Analysis.

Low Standard Roads (OML 1 and 2), Temporary Roads, and Recreation Motor Vehicles (RMV) Trails

An open, low standard road may have greater potential human impact on wolves than a Forest highway (Mech, Forest Plan file letter, 1986). With increased use of 4-wheel drive vehicles and ATVs any route accessible by these vehicles should be considered a road. Lightly traveled woods roads could have high risk to wolves if they are traveled by people who are known to utilize woods roads for the purpose of trapping or shooting at wolves (Mech, Forest Plan file letter, 1986, Fuller and Berg 1986). The Recovery Plan (USDI 1992) discusses the potential human threat to wolves using all types of roads even though the final guideline only addressed high standard roads. See the discussion above concerning road densities in the Minnesota Wolf Management Plan (MN DNR 2001). Attitudes could be changing such that road density parameters have changed, but this analysis will consider the potential for adverse human impacts related to roads.

Human access, either foot travel or with a Recreation Motor Vehicle (RMV), is usually on recreation trails, and on low standard and temporary roads developed for management operations, especially timber sales. Temporary roads, while open for a short period of time (1-4 years), would be obliterated and made impassable to motorized vehicles. New OML 1 roads would be effectively closed to road traffic and in the future, most would also be closed to ATV motorized use. Analysis below in Section 3.6 evaluates open temporary and OML 1 roads, not those that have been closed.

The purpose and need of the Travel Management Project (TMP) was to designate or decommission unclassified roads, and to provide loop routes and connections for longer distance riding opportunities on existing roads and trails that provide for enjoyable and consistently managed Off-highway Vehicle (OHV) riding experiences. In addition, the TMP implements the National Travel Management Rule (36 CFR 212, 251, 261 and 295). The Forest Service published the final rule for travel management in November 2005, which revised regulations and clarified policy related to motor vehicle use. The Rule requires designation of those roads and trails that are open to motor vehicle use, by vehicle class and by time of the year. The TMP is needed in order to move the existing conditions towards the Forest Plan goals, desired conditions, and objectives. This project specifically identified travel routes on Forest Service system roads that may be legally used by people driving off-highway vehicles, and either decommissioned or added unclassified roads to the Forest Service system.

Despite the policy of closing these roads, their corridors have in many cases remained in the forests. Human access into wolf habitat has been and potentially could be made easier as a result of these corridors regardless if it is on foot or with an RMV. If recreationists find them by skirting roadblocks, traveling cross-country, or by accident, further travel into wolf habitat could be easier. However, because of past conditions, including the lack of effective closures, the Revised Plan increases emphasis on effective closure of roads.

The effectiveness of road closures has been monitored by the Forest monitoring program. Since 2004 approximately 34 miles of road have been decommissioned, and an additional 109 miles of roads approved for decommissioning are planned. When these planned projects are fully implemented, a total of 143 miles of roads will have been decommissioned across the SNF. The Forest Plan objective is to decommission approximately 80 miles of road by 2014 (USDA 2010g).

In 2009 the “Nira Stewardship Project” was evaluated to determine the effectiveness of road closure methods used on the Forest to restrict large and small motorized vehicle use. Twenty-two (81%) of the 27 closures were found to be totally effective. At four sites road obliteration was not totally successful due to the poor survival of planted woody vegetation. While the plantings at these four sites were not successful, and did not result in totally effective closures, the report concluded that the closures were still effective in keeping motorized use to a minimum (USDA 2009b).

While site conditions differ at different locations across the Forest similar results are expected with successful application of road closure methods elsewhere on the SNF. Road closure direction in the Forest Plan expected to minimize or eliminate impacts caused by prior use (vegetation management projects) to lynx and critical habitat on the Forest.

In addition, active monitoring of illegal user created motorized trails has been ongoing on the Forest. Since 2004, over 40 user-created trails have been discovered and documented. Once user-created trails are found, their location and resource impact information is reported to decision-makers and Law Enforcement. During 2008 Law Enforcement recorded 22 incident reports and issued 17 warnings and citations related to recreationalists operating motor vehicles (USDA 2010g). Therefore, instances of motorized use on these closed or obliterated roads are being actively investigated, and regulations are being enforced when violators are found.

The Superior National Forest has an estimate of roads in association with the vegetation management goals for 100 years. The Revised Superior National Forest Plan does not assume a density, mileage, type, or distribution of recreational trails beyond the immediate planning horizon, nor have the recreation planners attempted to predict the nature or level of recreation in 100 years. Therefore, the long-term effect is based only on the estimate for temporary and low standard roads.

Indicators Selected to Address (3.5.2) Human Access: Low Standard OML 1 and Temporary Roads, Trails and RMV use

Indicator 3: Proposed miles of RMV trails

Indicator 4: Cross-country use policies for use of RMVs

Indicator 5: Miles of temporary and OML 1 roads

These factors are analyzed in detail and selected as an indicator because they provide a useful way to predict and compare levels of human use of wolf habitat. The Recovery Plan (USDI FWS 1992) discusses the potential human threat to wolves using all types of roads even though the final guideline only addressed high standard roads. Human use of any type of road increases the potential for accidental or intentional killing of wolves.

Not Selected as Indicator to Address (3.5.2) Human Access: OML 2 Roads

OML 2 roads are omitted from inclusion in Indicator 5 above because the Revised Plan does not change the density of these types of roads. These roads should be considered at project level if a change in densities of OML 2 roads is proposed. Existing road density of low standard (OML 2)

roads is shown below. Density on the Superior National Forest is calculated for OML 2 roads that are located within mapped Lynx Analysis Units (LAUs) (Source: 2010 data).

Superior NF: 1108 miles Forest Service system roads OML 2 within Mapped LAUs = **0.41** miles/square mile outside the BWCAW.

Den and Rendezvous Sites

The Federal Wolf Recovery Plan (USDI 1992) does not make management recommendations for restricting management in or around den and rendezvous sites. The Minnesota Plan (MN DNR 2001) considers the potential for human disturbance at den and rendezvous sites as unimportant for the following reasons:

- The area of Minnesota's wolf range and its wolf population is relatively large and likelihood of humans disturbing dens and rendezvous sites so minimal, it is not likely to have a significant effect.
- Wolves at dens and rendezvous sites have been known to tolerate nearby logging operation, military maneuvers, road traffic and road construction.
- Wolves have increased and continued to expand their range into areas where disturbance is quite likely. Wolves, it appears, have not been deterred from occupying or successfully reproducing in these areas of disturbance.

Although potential disturbances are considered minor, both plans proposed further studying the effects of human disturbance on wolf behavior, and discouraging human disturbance that may impact wolves.

Indicators Selected to Address (3.5.2) Human Access: Dens and Rendezvous Sites: NONE

This factor was not selected as an indicator because it is not a limiting factor and because it is better analyzed at a project level rather than at Forest Plan programmatic level. In addition, Revised Plan provides the following provision to help mitigate potential effects.

- **G-WL-10** Provide for the protection of known active gray wolf den sites during denning season.

However, even with the guideline identified above there is a potential for disturbance to unknown den sites during management activities, as treatment units will not be surveyed prior to cutting. Very few den sites are known, and discovery is unusual. Project level analysis could identify potential for disturbance to wolves, realizing that a den site could occur in countless areas, and may not be discovered, even with a field inventory. Wolves have no set distances of tolerance. They have been known to choose den sites close to human habitation and roads (Mech et al. 1991) and to raise pups adjacent to logging operations, road construction, and mining activities with no negative effects (Mech, Forest Plan file letter, 1995). The risk of effect to rendezvous sites may be slightly higher than to den sites, because the majority of new trail and road construction would likely occur between July and October after wolves have moved pups from den sites to rendezvous sites. Wolves would most likely move pups if heavy machinery and noise

occurred at a den site during the denning period (Mech Forest Plan file letter, 1995). Wolves will sometimes abandon a den and move pups by mouth if greatly disturbed by humans. No pup mortality has been reported to result from human disturbance (Mech et al. 1991).

Large Tracts of Wild Land Forested Habitat

The 1992 Recovery Plan (USDI 1992) states wolves may survive in areas with significant human development, but they prefer large tracts of wild land forested habitat with low human density and minimal access by humans. Large tracts relatively un-fragmented by roads and human developments (>4,000 to 5,000 square miles) can maintain a wolf population above the minimum viability level, and serves as a population source from which wolves can migrate to some of the more developed areas of northeast Minnesota.

Indicators Selected to Address (3.5.2) Human Access: Large Tracts of Wild Land Forested Habitat: NONE

This factor was not selected as an indicator because it is adequately addressed by road and trail indicators. In addition, the Boundary Waters Canoe Area Wilderness on the Superior National Forest in combination with Voyagers National Park and Quetico Park in Canada, provide some of the largest tracts of wild land forested habitat in this region. Management of these areas and the contribution that they make to large tracts of wild land forested habitat will not likely change in the foreseeable future.

2.6 – Affected Environment and Environmental Consequences

2.6.1 Affected Environment

Prey Habitat

Indicator 1: Acres and percent of young upland forest < 10 years old

Indicator 2: Acres and percent of upland conifer (spruce and pine) >9 years old on all uplands.

Moose Populations

The Superior covers a majority of the Northeast Area moose range, located in half of St. Louis County and all of Lake and Cook Counties. Population estimates from aerial surveys in northeastern Minnesota, conducted since 1959, suggest that the population gradually began to increase in the 1970's and 1980's to a peak of 6,900 in 1988 then dropped to 3,700 by 1990, and then appeared to have stabilized between 3,500 and 4,000 animals, or approximately 0.7 moose/sq. miles, between 1996 and 2001 (Lenarz 2002). Due to a change in MN DNR survey methods in 2004; point estimates from surveys conducted in 2005 and afterwards are not directly comparable to prior surveys. An estimated $5,528 \pm 1,318$ moose occurred in northeastern Minnesota in 2010 which was not statistically significant different from the 2009 estimates of

7,593± 1,746 (Lenarz 2010a). Although a decline in point estimates from 2005-2010 was not statistically significant due to the small sample size (n=6 years) (Lenarz 2010a), simulation modeling indicates that the northeastern Minnesota moose population was declining by about 15% per year over the long term (Lenarz et al. 2010b). Both the cow to calf ratio and the percent calves has exhibited a significant decline over the past 13 years (Lenarz 2010a).

Although moose remain common throughout much of northeastern Minnesota, recent research indicates that temperature metrics explained a high proportion of variation in seasonal or annual moose survival (Lenarz et al. 2009) which raises concerns regarding long-term viability of the northeastern population (Lenarz et al. 2010b), due to current climate change projections (IPCC 2007, Murray et al. 2006).

We know of no documentation expressing a correlation between the wolf and moose population fluctuations on the Superior. Moose data are not available at a resolution to make the comparison. David Mech (Forest Plan file letter, 1995) indicates some of the wolf packs being monitored in the BWCAW appeared to switch from deer to moose as a main prey in the late 1980s to early 1990s.

Deer populations

The following deer density data are from Minnesota DNR white-tailed deer reports (Lenarz 2010a, Lenarz 2010c, pers. comm.).

On the Superior, the pre-fawn densities from 1996 to 2009 ranged from 2 to 24 deer per square mile. In general, the northwest side has higher densities than the rest of the Forest. The lowest densities occur through the mid-section (between 2 and 4 per square mile).

Based on density targets set during 2005 and 2006, the 2010 pre-fawn deer density was above goal over much of the forest zone of Minnesota (Lenarz 2010a). The Minnesota DNR biologists have learned that deer density is controlled more by winter cold and snow depth, than by habitat potential (Lenarz 2010c, pers. comm., and Ingebrigtsen, pers. comm.). Therefore, population management revolves more around controlling the harvest of antlerless deer in reaction to the status of the deer population on individual permit areas. This strategy seeks to maintain deer at relatively constant levels at permit area specific population goals while allowing hunting (Lenarz 2010c, pers. comm., Ingebrigtsen, pers. comm.).

Experience in Minnesota strongly suggests that, at the current deer population level, wolves do not suppress deer numbers. For more than 20 years the Minnesota DNR has successfully managed deer populations at levels that have provided increasing hunter harvests and ample prey for wolf recovery and persistence despite the typical mortality factors (MN DNR 2001).

Beaver Populations

Beaver populations are not monitored closely by the Minnesota DNR, though there are eleven aerial survey routes in the northern forested region (scaled back from 25 prior to 1993). These can only indicate possible trends, and erratic results (annual ups and downs since the 1980s) have not

allowed reliable documentation of the beaver population in Minnesota. Forest Service personnel on the National Forest have not monitored beaver populations. Minnesota DNR furbearer biologist, John Erb (2002, pers. comm.), assumes a decline in population based on beaver monitoring and anecdotal information. Monitoring data show a decreasing trend since the early 1990s four-decade high to levels similar to the late 1980s (MN DNR 2001a). However, currently beaver are well distributed and still occur in good numbers across the Superior National Forest.

Prey Habitat (Deer, Moose and Beaver)

Table Wolf-2 below displays the existing (2010) and past (2004/2005) amounts of Indicator 1: forage habitat for moose, deer, and beaver and Indicator 2: cover habitat for moose and deer.

Table Wolf-2: Indicator 1 – Forage habitat, Indicator 2 – Upland conifer cover habitat (Acres and percent of total upland forest).		
Year **	Indic 1: Forage (<10 yrs old)	Indic 2: Upland Conifer Cover (>9 yrs old)
2010	65,093 acres	343,767 acres
	6.8%.	36%.
2005	69,249 acres	354,067 acres
	7.1%.	36.5%.
2004**	125,000 acres	321,900 acres
	13%.	34%.
** Total upland forest on Superior (outside BWCAW): 2004 - 963,700 ac., 2005- 968,518 ac., 2010- 956,358 ac Source: USDA 2004 Forest Plan Dualplan**, and USDA 2011e (2005/2010 data)		

The data in Table Wolf-2 differs between 2004, 2005 and 2010 because the data used in the 2004 Forest Plan was based on a 2003 stand dataset. After this 2003 dataset the Forest stand “year-of-origin” data was re-typed. Between the 2003 dataset and the 2005 dataset (the earliest repeatable dataset) the Forest Plan was signed. Therefore, the 2004 Forest Plan wolf forage (Indicator 1) and cover (Indicator 2) data is no longer repeatable. 2005 data is displayed to show the difference between the Forest Plan and newly re-typed habitat data.

Since 2005, the Forest has used this re-typed stand “year-of-origin” data to calculate upland conifer habitat (<10 = 0-9 old and ≥10 years old) for the wolf forage and cover analysis. This habitat data is more accurate, consistent and repeatable, and therefore errors on the side of the species. These data will be used in Tables Wolf-2, Wolf-4, and Wolf-5.

Human Access

Indicator 3: Proposed miles of RMV trails

Indicator 4: Cross-country use policies for use of RMVs

Indicator 5: Miles of temporary and OML 1 roads

Table Wolf-3 displays the 2004 and current conditions of Human Access Indicators.

Table Wolf-3: Indicators 3 and 5: Existing conditions of designated ATV and snowmobile trails and low standard and temporary roads.				
Year	Indic 3: ATV Trails	Indic 3: Snowmobile Trails	Indic 5: OML 1 Roads	Indic 5: Temp Roads‡
	Miles	Miles	Miles	Miles
2010	40	705 (1562*)	948	158
2004	40	686 (1509)	883	432
‡ USDA 2004 BA, and USDA 2011e (2010 data)				
* Total mileage on all ownerships within Forest boundaries				
Source: Final EIS, Chapter 3.8 and Appendix F.				

Indicator 4: Policy on cross-country use of ATVs and snowmobiles

The current policy on ATV and snowmobile use on low standard roads or cross-country is described and analyzed in more detail in the Final EIS, Chapter 3.8.3. In summary, the policy is:

- Superior National Forest prohibits cross-country ATV use and allows cross-country snowmobile use. “Allowed” means that use could occur as long as the land, wildlife, or vegetative resources can withstand use. ATV use is generally allowed on OML 1 and 2 and Unclassified roads.

2.7 Environmental Consequences

2.7.1 General Effects

Vegetation Management

General direct and indirect effects of vegetation management on wolf are generally similar to those on lynx. Refer to Section 3.6.2.2 for review of proposed or probable practices and activities that may influence lynx and its habitat.

Moose and Deer

The Revised Plan does not propose specific population goals for deer and moose other than to collaborate with Minnesota DNR in managing habitat to provide for populations sufficient to promote wolf recovery. Moose and deer populations and habitat are expected to fluctuate with the implementation of the Revised Plan, in part as a result of forage conditions. However, there are other critical factors that determine populations, especially winter severity, disease, wolf predation, game management by the State, and vehicle collision. In other words, providing forage by specific acreage would not guarantee specific populations. Even though the correlation between habitat and populations appears to be weak, the Revised Plan prescribes vegetation management designed to achieve young forest (primarily timber harvest) and conifer cover to provide for deer and moose. As a result, implementation of the Revised Plan is expected to produce forage habitat to provide for moose and deer populations sufficient for wolf recovery.

2.7.2 Resource Protection Methods

The Superior National Forest Revised Plan contains the following common actions, potential effects, and mitigation measures:

Wolf Management Direction in Revised Plan

Direction specific to wolf is found in the Superior National Forest Revised Plan (Chapter 2, sections on Terrestrial and Aquatic Wildlife: Threatened and Endangered Species):

1. **DC-WL-3:** Aquatic and terrestrial wildlife habitats and species populations, while constantly changing due to both management activities and naturally occurring events, are present in amounts, quality, distributions, and patterns so that National Forest lands: (c) Contribute to the conservation and recovery of federally-listed threatened and endangered species and the habitats upon which these species depend.
2. **O-WL-4:** Maintain protect, or improve habitat for all threatened and endangered species by emphasizing and working towards the goals and objectives of federal recovery plans and management direction in Forest Plans.
3. **O-WL-5:** Seek opportunities to benefit threatened and endangered species by integrating habitat management objectives into plans for the full spectrum of management activities on NFS lands.
4. **O-WL-6:** Reduce or eliminate adverse effects on threatened and endangered species from the spectrum of management activities on NFS land.
5. **O-WL-16:** Promote the conservation and recovery of the gray wolf. Population goal minimum: contribution to State-wide population goal of 1251-1400.
6. **S-WL-4:** Management activities for the gray wolf will be governed by Recovery Plan for the Eastern Timber Wolf (Revision): 1992
7. **G-WL-10:** Provide for the protection of known active gray wolf den sites during denning season

Road and Trail Management

The maximum road density standard on the Superior for OML 3, 4 and 5 roads is 1 mile per square mile, and the guideline would be applied to the north half of the Chippewa (north of Highway 2). Except for road straightening, or possibly short access roads to boat launches and similar projects, no new OML 3, 4, and 5 roads would be built as a result of implementing the Revised Plan over the next few decades.

Management direction prescribed for the Canada lynx and other resources would also mitigate potential adverse effects to the wolf associated with human access. Refer to Forest Plan

Objectives, Standards, and Guidelines section for Wildlife, Watershed Health, Trails, and Transportation for direction related to roads and trails management. Key direction includes:

Wildlife

1. **D-WL-5:** Roads and trails are managed to maintain native plants and animals, protect water quality and quantity, and to encourage human use in some areas and discourage it in others.
2. **G-WL-8:** Within LAUs generally maintain road and snow-compacting trail densities below 2 miles per square mile to maintain the natural competitive advantage of lynx in deep snow. Where total road and regularly-used snow-compacting trail densities are greater than 2 miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline “roads” include all ownerships of classified and unclassified roads and “regularly-used trails” are those that are used most years for most of the snow-season.
3. **S-WL-4:** Management direction from Wolf Recovery Plan (USDI FWS 1992): Road density standards: The maximum road density standard for OML 3, 4, 5 in Zones 1 and 2 on the Superior would change from 0.9 to 1 mile per square mile.

Recreation

1. **O-RMV-1 SNF:** A maximum of 90 additional ATV trail miles and 100 CNF/130 SNF snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system.
2. **S-RMV-1 SNF:** Motorized recreation use of designated trails is prohibited unless the trail is designated open for specific motorized uses such as for ATVs, OHMs, and snowmobiles.
3. **S-RMV-3 SNF:** Cross-country OHV travel is prohibited. Standards and guidelines for cross-country snowmobile use are described in Chapter 3 because direction for that use varies by Management Areas. *Summary from Chapter 3:* For most Management Areas: Cross-country snowmobile use is generally allowed unless prohibitions or restrictions are needed for resource protection to meet management objectives. *For Unique Biological, Research Natural, and Wilderness:* Cross-country snowmobile travel is prohibited.
4. **G-RMV-4 SNF:** RMV use will generally be allowed on existing unclassified, OML 1, and OML 2 roads. (Except ORVs will generally be prohibited on OML 1 roads.) Roads that are determined through site-specific analysis to have immitigable resource and social concerns and/or do not meet management objectives would be effectively closed. (See exceptions for Management Areas: wild segments of Eligible Wild, Scenic, and Recreational Rivers, Semi-primitive Non-motorized Recreation, Research Natural Areas, Candidate Research Natural Areas, and Unique Biological Areas.)

Transportation System

1. **O-TS-2:** Few new OML 3, 4, 5 roads will be constructed.
2. **O-TS-3:** New roads built to access land for resource management will be primarily OML 1 or temporary and not intended for public motorized use. Temporary roads will be obliterated after their use is completed. All newly constructed OML 1 roads will be effectively closed to motorized road and recreational vehicles following their use unless they are needed for other management objectives.
3. **O-TS-7:** Unneeded roads will be decommissioned and closed to motorized vehicles. Roads that are not necessary for long-term resource management are considered “unneeded”.
4. **S-TS-3:** As soon as access use is completed, stabilize temporary roads and effectively close them to motorized traffic. Vegetation will be established within 10 years after the termination of the contract, lease, or permit.
5. **S-TS-4:** Decommission unclassified roads that are not needed in the Forest road and trail system and special use permitted roads that are no longer needed. Decommissioning will make the road unusable by motorized vehicles and stabilize the roadbed.
6. **G-TS-12:** On existing OML 1 roads, an effective barrier will generally be installed as needed to prevent use by highway-licensed vehicles and ORVs. ATV and OHM use may continue to be allowed on some existing OML 1 roads
7. **G-TS-14:** Temporary roads are generally not intended for public use, but public use may be temporarily allowed if needed to meet management objectives

These road control measures, in conjunction with the removal of stream crossings, and trail management would reduce potential for recreational motor vehicle (RMV) use in areas close to dens or rendezvous sites. Therefore, new road, either of gravel or pavement, would not threaten den or rendezvous sites.

Riparian Area Management

The Final EIS, Chapter 3.6 and Superior National Forest Revised Plan direction in Chapter 2 Watershed and Riparian Management sections describe management guidance and effects of riparian management. Management within the near bank zone generally would emphasize management for riparian values, including, in some cases, older forest and long-lived species, but would also allow timber management to promote the objective of restoring functional riparian areas. This could include timber harvest, where it may be warranted, based on a fifth level watershed analysis, to promote young aspen for beaver. Management may also discourage beaver in some areas to protect important or critical riparian habitats, sensitive species, or trout management.

Boundary Waters Canoe Area Wilderness

On the Superior, the current and predicted vegetation conditions for moose and deer habitat in the Boundary Waters Canoe Area Wilderness (BWCAW) are analyzed in the BWCAW Fuel Treatment Final EIS (USDA 2001a). The contribution of the BWCAW to provide forage in young upland forest for beaver, moose, and deer, and the persistence of pine, spruce, and fir for moose and deer would remain the same under Revised Plan implementation as in previous Plans. Therefore, the potential for impacts to wolves within the BWCAW has not changed. The Revised Plan includes a section on BWCAW management direction (Chapter 3). The Final EIS provides some comparisons to conditions within the BWCAW and are included to give a sense of context. For these reasons above we haven't include BWCAW conditions in the effects analysis of this Final BA.

The recent Final EIS for BWCAW fuel treatment (USDA FS 2001a) documents the conclusion of the Forest Service that overall, the effects of the selected alternative on gray wolves in the BWCAW are expected to be minimal. Over the short-term beneficial indirect effects on gray wolves would likely result from short-term increases in prey habitat. Over the long term, foraging habitat would be expected to decrease. The potential for increased access for land-based recreation (hiking, dog sledding) was not expected to increase as a result of fire control line construction. Thus, it was determined that fuel treatment in the Boundary Waters Canoe Area Wilderness *may affect, but would not be not likely to adversely affect the gray wolf or result in destruction or adverse modification of critical habitat for the gray wolf*. Through consultation, the FWS concurred with this assessment (USDI FWS 2001).

2.7.3 Direct and Indirect Effects

The direct and indirect effects related to prey habitat and human access are summarized below. The Revised Plan was assessed by their provision for moving toward or away from the preferred management strategies for habitat and human contact found in the wolf Recovery Plan.

Direct effects of vegetation management on wolf are very similar to those analyzed for Canada lynx in Section 3.6.3 and are generally not repeated here for wolf.

Prey Habitat

Indicator 1: Forage: acres of young upland forest < 10 years old

Indicator 2: Cover: acres and percent of upland conifer (spruce and pine) >9 years old on all uplands.

Tables Wolf-4 and-5 displays the current (2010), past (2004/2005) conditions, and predicted conditions of Prey Habitat Indicators, and Range of Variability (RNV) as a result of implementing Revised Plans.

Table Wolf-4: SNF Indicator 1: Acres and percent of young (0-9 year old) upland forest on Superior National Forest. ‡		
		Revised Plan
2010	Acres (1,000s)	65.0
	Percent	6.8 %

Table Wolf-4: SNF Indicator 1: Acres and percent of young (0-9 year old) upland forest on Superior National Forest. ‡

		Revised Plan
2005	Acres (1,000s)	69.2
	Percent	7.1%.
2004	Acres (1,000s)	125.0
	Percent	13.0%
Decade 1	Acres (1,000s)	100.0
	Percent	10.4%
Decade 2	Acres (1,000s)	101.7
	Percent	10.4%
Decade 5	Acres (1,000s)	97.7
	Percent	10.2%
Decade 10	Acres (1,000s)	94.2
	Percent	9.8%
Est. low end RNV	4.0%	
Est. mid pt RNV	6.0%	
Est. high end RNV	8.0%	
‡Source: USDA 2004 Forest Plan Dualplan, and USDA 2011e (2005/2010 data)		

Table Wolf-5: SNF Indicator 2: Acres and percent of upland conifer forest >9 years old on Superior National Forest.‡

		Revised Plan
2010	Acres (1,000s)	343.7
	Percent	36%.
2005	Acres (1,000s)	354.0
	Percent	36.5%.
2004	Acres (1,000s)	322.0
	Percent	34%
Decade 1	Acres (1,000s)	371.3
	Percent	38.7%
Decade 2	Acres (1,000s)	411.7
	Percent	43%
Decade 5	Acres (1,000s)	531.0
	Percent	55%
Decade 10	Acres (1,000s)	554.0
	Percent	58%

Table Wolf-5: SNF Indicator 2: Acres and percent of upland conifer forest >9 years old on Superior National Forest.‡		
		Revised Plan
‡Source: USDA 2004 Forest Plan Dualplan, and USDA 2011e (2005/2010 data)		

Short-term effects (Decades 1-2)

Prey habitat

The Superior National Forest Revised Plan proposed to harvest 130,967 acres in the first decade. As of the writing of this document (date), 20,741 acres have been harvested since implementation of the Revised Plan. Refer to Final EIS, Chapter 3.4.1 for more specific information related to acres harvested. Additional analysis of white tailed deer, Indicator 22 can be found in the Final EIS Section 3.3.6.4.

On the Superior National Forest, the Revised Plan shows a similar decreasing trend in young forest in Decades 1 and 2, compared to current levels. Based on the response of local populations of moose and deer to available forage in the last two decades, the Revised Plan would provide forage at a more than adequate level for high populations. The Revised Plan would result in increasing amounts of conifer in Decades 1 and 2, thus providing more thermal and escape cover than current levels.

Long-term Effects (Decades 5-10)

Prey habitat

On the Superior National Forest the amount of young forest is predicted to decrease by Decade 10, compared with current levels. The conifer component would substantially increase (24%). The Revised Plan would provide deer and moose forage at more than adequate levels. Plans would provide much more young forest and less conifer forest than likely was found under the natural range of variation.

Human Access (Decades 1-2 and 5-10)

Indicator 3: Proposed miles of RMV trails

Indicator 4: Cross-country use policies for use of RMVs

Indicator 5: Miles of temporary and OML 1 roads

The Superior National Forest Revised Plan remains within the Recovery Plan guidance relating to road density. Human access, both foot travel and with a Recreation Motor Vehicle (RMV), is usually on recreation trails and on low standard, and temporary roads developed for management operations, especially timber sales. While open, these trails and low standard roads provide access to wolf habitat. The trend towards continued growth of the human population creates a related increase in people recreating on national forest land. The current distribution of wolves in Minnesota is spread over areas of highly varying road densities and human settlement. The threshold at which wolves can tolerate human disturbance is not known. All indications are that

wolves prefer blocks of natural habitat, and research is not available on the possible limits to human intrusion into the habitat, nor its effects on wolf viability. Tables Wolf-6 through Wolf-8 displays the existing Decade 1 (2004 - 2010), Decades 1-2, Decades 1-10 conditions of Human Access Indicators as a result of implementing the Revised Plan.

Table Wolf-6: Indicator 3: Existing and Maximum new designated ATV and Snowmobile trails				
Decade 1 /Year	Indicator 5: ATV Trails		Indicator 6: Snowmobile Trails	
	Designated Miles	Decade 1 max additional miles	Designated Miles	Decade 1 max additional miles
2010	47.1	82.9	705 (1,562 forest-wide)*	130
2004	40	90	686 (1,509 Forest-wide)	130

Source: Project file, FEIS chapter 3.8 (Tables RMV-2 and RMV-3). USDA 2011e (2010 data)

Table Wolf-7: Indicator 4: Cross-country ATV and Snowmobile Policies		
Forest Emphasis – Decades 1-2	2004	2010
SNF ATV Cross-Country	Prohibited	No Change
SNF Snowmobile Cross-country	Allowed*	No Change

Source: USDA 2004 Forest Plan, p. 2-44, S-RMV-3

Notes: *See Forest Plan Chapter 3 for exceptions by Management Area.

Site-specific deviations could also occur during implementation.

Table Wolf-8: Indicator 5: OML 1 Roads and Temporary Roads on the Superior National Forest.				
	OML 1 Roads		Temporary Roads	
	(miles)	(miles)	(miles)	(miles)
2010		948		158
2004	883		432	
Decade 1		1132		754
Decade 2		1334		764
Decade 3		1485		761
Decade 10		2,022		764

Source: USDA 2004a Project file, FEIS chapter 3.8 (tables RMV-2 and RMV-3). USDA 2011e (2010 data)

Short-term effects (Decades 1 and 2)

Negative effects from issues of human access reduced the positive potential for wolf and prey habitat present.

Human access

Discussion: The Forest Plan states we are allowed to construct up to 90 miles of ATV trail in addition to the baseline trail system defined in the Plan. After the Forest Plan was approved the Forest realized that there was an additional 7.2 ATV trails which were not calculated in the mileage during the Forest Plan process (USDA 2010e) show that this constituted 7.1 miles. As of 2010 the Forest has 82.9 miles (90 - 7.1 miles) available for new ATV construction.

An error in the calculating the designated and forest-wide (both NFS and non-NFS) snowmobile trail miles (Indicator 6) was discovered in the 2004 BA. The 2004 BA referenced the FEIS which specified that the...”Forest manages 705 miles of its 1,562 miles outside the BWCAW for snowmobile use” but the values of 686 miles and 1,509 Forest-wide were erroneously entered into the 2004BA (USDA 2004a FEIS 3.8.44, and 2004b BA). To confirm the FEIS numbers GIS data and recreation department records were reviewed. The error was an early estimate that was not corrected in the 2004 final BA. Efforts to track and update route mileage are ongoing and will be reviewed on an annual basis.

Revised Plan for the Superior NF generally allows cross-country travel by snowmobile, except for in the BWCAW and a small portion of the Forest outside the BWCAW that is in Research Natural Areas or Unique Biological Areas. Superior National Forest prohibits cross-country ATV travel as per Forest Plan direction S-RMV-3.

The Superior National Forest Revised Plan provides for an increase in ATV and snowmobile trails on both Forests, potentially allowing the most trail construction and therefore more potential for human disturbance than current conditions. The Forest has not constructed any new ATV and snowmobile trails since 2004. Therefore, there is no change in the 130 miles of Decade 1 maximum additional miles of snowmobile trail that can be constructed. Because there has been essentially no change in the ATV and snowmobile trail construction miles effects to wolf are essentially unchanged. Since no additional ATV and snowmobile trails have been constructed there has been no additional fragmentation of wolf critical habitat. Without any new additional ATV and snowmobile trails wolf habitat conditions should be the same as it existed in 2004. The Forest Plan provides direction to manage ATV and snowmobile use as it changes over time.

In 2009 (USDA 2009) the Forest made a decision to decommission 154 miles and designate 142 miles of unclassified roads to the Forest Service system. The TMP decision converts 14 miles of unclassified roads to system motorized trail. The Forest Plan provided direction for trails. For example, if the Forest were to construct a new ATV trail it would count toward the 90 miles of Decade 1 maximum additional miles. Also, if the Forest were to close a road and turn it into an ATV trail, it would count toward the 90 miles. If Forest were to construct a road for logging purposes but allow ATV use, it would not count toward the 90 miles of Decade 1 maximum additional miles. However, the decision will create 2.5 miles of new trail to provide linkages. When constructed the 2.5 miles of new trail would apply to the allowed ATV and snowmobile trail system mileage in Table Lynx-23.

The Superior National Forest Revised Plan shows a relatively large increase of temporary and OML 1 roads from current conditions. By Decade 2, conditions would be very similar to current conditions. These road and trail opportunities provide the highest potential for den site disturbance, shooting, trapping, and collisions with wolves. The hunting and winter trapping seasons would be the time of highest risk to wolves (Fuller 1989). Any corridor open to RMVs provide the potential for hunters and trappers to shoot, harass, trap (mostly incidental), injure, or collide with wolves. Although incidents of wolf poaching are lower today than in the past (Fuller 1997), human killing of wolves remains a fact today despite the wolf’s legally protected status. It is reasonable to assert, then, the more human access in wolf habitat by whatever means, the greater increase in chances for negative contact.

The principle of compensatory mortality is believed to occur in wolf populations. This means that human-caused mortality is not simply added to “natural” mortality, but rather replaces a portion of it. Based on 19 studies by other wolf researchers, Fuller *et al.* (2003, pp. 182-186) concludes that human-caused mortality can replace about 70 percent of other forms of mortality. Mech (2001) argued that the number of wolves in Minnesota would not be permanently reduced with a human harvest below approximately 47% of the population. This data is supported by several case studies (Fuller et al. 2003). Such a high taking rate is unlikely under the recovery plan and the Minnesota wolf management plan. The notion that human caused mortality is largely compensatory has been recently challenged, however (Creel and Rotella 2010), in studies of western populations.

Human tolerance for wolves may become strained if people perceive wolves as threats to livestock and pets, or as competitors for game (Person and Russell 2008). Under those circumstances, legal and illegal killing of wolves may make wolves much more sensitive to density of roads and human activity (Person and Russell 2008). However, wolves are abundant and well-distributed in the western Great Lakes region, especially Minnesota. From 1996 to 2009, USDA APHIS Wildlife Services (WS) removed 2,151 wolves (an annual average of 146 wolves with a 95 percent confidence interval of 132 to 159) as a result of depredation control in Minnesota (Table Wolf-1, p. 26, and Hart 2010, pers. comm. USDA – Wildlife Services).

The potential risk to wolves from canine parvovirus has reduced pup survival both in the Superior National Forest and throughout Minnesota, between 1984 and 2004. There is evidence of a slight increase in pup survival in Minnesota since about 1995 (Mech et al. 2008). While wolf mortality from canine parvovirus has occurred and still exists in the wolf population it has not been a key factor in limiting wolf abundance and distribution since the mid-1990s (see **Section 2.5.2**).

While the potential exists of human access on roads could increase chance of introducing new diseases and parasites to wolves via pets, road densities are higher off National Forest lands than on NFS lands in northern Minnesota. Wolf populations are high and the species has expanded its range in northern Minnesota into Wisconsin and the upper peninsula of Michigan. All these non-National Forest areas expose wolves to humans and their pets and no large outbreaks of canine parvovirus have occurred. On May 4, 2011 the USFWS published a proposed rule to remove gray wolves from the Endangered Species Act in the Western Great Lakes area and no longer require protection of the ESA (USDI 2011). Any increased risk of canine parvovirus to wolves and APHIS control efforts.

Long-term Effects (Decades 5 and 10)

Human access

On the Superior NF by Decade 10, road miles would be substantially increased from current conditions. As in the short-term, the level of temporary roads open at one time could potentially disturb packs at dens and rendezvous sites. Both increased and current amount of road miles may encourages recreational activities, which could lead to wolf/human conflict, even though the Revised Plan provides fairly beneficial habitat.

While individual wolves may be threatened, wolf populations are likely to remain viable on either Forest, at least in the 10 – 15 year Plan horizon. The Superior National Forest Revised Plan requires compliance with the Recovery Plan for the Eastern Timber Wolf. The Plans' main concerns are for limiting roads drivable by two-wheeled, highway vehicles, and maintaining prey.

2.7.4 - Cumulative Effects

The incremental effects of past federal and non-federal actions on wolves are reflected in the existing condition. Past land management activities on all ownerships have shaped the habitat that exists today for wolves on the Forest. The Forest Plan predicts that additional impacts would occur on lands outside of National Forest jurisdiction. When these impacts are considered in combination with proposed actions of this project, cumulative effects could occur.

Past, present and reasonably foreseeable future actions (2004-2014) are considered in this analysis. Past, ongoing and future Forest projects that affect wolves and wolf habitat are consulted on separately and have or will receive determinations of effect on a project-by-project basis. A list of potential foreseeable future federal and non-federal actions considered in the analysis area is listed in Appendix A. Key ongoing or foreseeable future federal actions on the Forest that have the potential for affecting wolves and wolf habitat are summarized below. Consultations for these projects are separate from this BA.

1. Federal Hardrock Mineral Prospecting Permits EIS (in draft)
2. PolyMet Mining, Inc.- North Met Project. Proposed hardrock mine and land exchange. EIS (ongoing).
3. Twins EA – Gunflint Ranger District. Vegetation management project.
4. Tracks Project EIS - Laurentian Ranger District (2010). Vegetation management project.
5. Toohey Project EA – Tofte Ranger District (2011). Vegetation management project.
6. Birch Project EA – Kawishiwi Ranger District (2011). Vegetation management project.
7. Travel Management Project EA - Forest-wide (2009; under litigation). Transportation actions that do not include construction of new roadways.
8. South Fowl Lake Snowmobile Access Project EIS – Gunflint Ranger District.
9. Tomahawk Trail Victor Lake By-pass EA – Tofte Ranger District (on hold)
10. Other Activities on Other Ownerships

Determining impacts to wolves and wolf critical habitat at this time for some other foreseeable future federal and non-federal (Appendix A) actions are problematic based on the lack of site-specific information that hasn't been developed. Determining impacts to wolves and wolf critical habitat effects will be completed at the project-level when analyses are completed, but can be discussed in general terms at this time. Past, present and future federal and non-federal actions are addressed in the following narratives.

Minerals Management Projects

Drilling for mineral exploration is most likely to cause cumulative impacts for wolves. Temporary road construction and drilling would cause possible effects which could displace wolves from habitat near drill sites, and would contribute to cumulative temporary road densities which could

increase human/wolf conflicts due to increased human access during the time that roads are used. Vegetation clearing at drill sites could provide snowshoe hare habitat after drilling activities cease and the sites begin to revegetate.

Land exchanges in proposed mining sites could have mixed impacts such as a loss of wolf prey habitat in the proposed mining sites, but a gain of habitat in others areas that are currently in other ownerships. This could lead to a consolidation of wolf prey habitat where the US Forest Service would gain ownership. Habitat lost by large-scale mining operations would be an irreversible or irretrievable impact to wolf prey due to the large-scale changes in landscape character at the mining sites.

Vegetation Management Projects

Vegetation management projects are proposed to manage the vegetation and road system in project analysis areas towards the desired conditions stated in the Forest Plan. Forest management intends to improve stand diversity through harvest to restore desired forest conditions, and reduce hazardous fuels through site preparation and prescribed burning. Temporary roads could be used for access. These activities would affect foraging conditions for wolf prey and potentially impact wolf denning habitat. Temporary road construction could increase human/wolf conflicts by providing human access during the time that roads are used.

Roads Projects

Proposed vegetative management projects will require logging roads to achieve resource management objectives. Federal and/or state highway work across NFS lands requires an assessment of potential effects to wildlife species to identify potential mitigative measures. Other transportation actions do not include construction of new roadways but the decommissioning of existing roads to manage and consolidate human use and access. The Forest Plan predicts that future road development practices forest-wide include the construction of 82 miles of OML-1 roads for summer use and 167 miles of OML-1 roads for winter use over the next several years.

Recreation Projects

Both the South Fowl Lake Snowmobile Access Project EIS and Tomahawk Trail Victor Lake Bypass EA would provide public access on NFS lands to recreation sites or private property (respectively). Both projects are incomplete, but could impact wolves and their habitat depending on final project decisions.

Forest Plan direction would be applied to minimize or eliminate potential adverse effects. The Forest Plan allows up to 90 miles of new ATV trails and 130 miles of new snowmobile trails may be designated in Decade 1 (USDA 2004). Table Lynx-18 displays the amounts of ATV and Snowmobile trails measured by Indicators 5 and 6.

Activities in Other Ownerships: Wolf Habitat within and outside the National Forest proclamation boundary

Within the proclamation boundary, there are other lands that are outside the jurisdiction and authority of the Forest Service. These lands of other ownership may be owned by private individuals, industrial and commercial groups, the state of Minnesota, county and local government, or other federal agencies but all the lands are referred to in this biological assessment as “private lands” or “lands of other ownership.”

In these areas additional adverse impacts to wolf could occur outside of National Forest jurisdiction. Increases in the potential for human access into wolf territory would occur as people buy, subdivide, and develop private parcels of land. Activities on these private, state, county or other federal lands that may influence wolf habitat include mining, quarries, mineral exploration, mineral processing plants, timber harvesting, and recreational activities (including motorized and non-motorized uses). Of these mining activities can result in the loss of prey habitat when mines and processing plants are excavated or built. The loss of prey habitat in these areas off National Forest lands have not reduced available prey or affected wolf populations in northern Minnesota.

State of Minnesota land for the North Shore and Border Lakes Subsections show that there are access needs for resource management, but these are almost all ‘resource management access routes’ and ‘temporary access routes’ that are closed to motorized use by the public. Roads built on county forest lands may be accessible to the public, but roads on private land for resource management projects would likely not be accessible to the public.

New road construction would be needed to access this property. Harvesting on State, county, and private land would also require additional road development. Not all of these roads would be effectively closed following harvest. In an attempt to help meet recreational demand for more motorized trails, county and State land managers are considering development of additional ATV trail systems in north central and northeastern Minnesota.

Even-age harvesting on State, county, and private land would continue to provide habitat for deer. In addition, both the State and county are increasing the conifer component on their lands. Overall, more than adequate deer habitat is available in north central and northeastern Minnesota. This condition is not expected to change. Trends in edge habitat appear to be increasing (Wolter and White 2002).

Shooting, trapping, or other harassment of wolves would most likely continue to occur on all land ownerships at a minimal level. Additional mortality associated with vehicle collision would continue, especially if design speeds on non-federal roads increase. Based on increasing wolf populations over the past two decades, cumulative impacts to wolf related to changes in habitat and human disturbance are not expected to have major impacts on wolf populations.

For USFS projects in these areas a more detailed analysis may be warranted as the Forest Service considers the existing habitat conditions and cumulative actions on all ownerships within these non-USFS critical habitat areas.

Human access

Indicator 5: Miles of temporary and OML 1 roads

This indicator is used again as a measure of potential change in human disturbance and harm to wolf resulting from the Federal Hard Rock Mineral Prospecting Permits EIS. Because this project is reasonably foreseeable to occur, the potential direct, indirect and cumulative effects to wolf and critical habitat are discussed here.

The Federal Hard Rock Mineral Prospecting Permits Draft EIS (USDA 2011) is expected result in temporary roads being constructed over the next 20 years for minerals prospecting (drilling). The information is summarized in Table Wolf-9, from the EIS analysis, for the current and potential 20-year conditions for temporary roads only for determining cumulative effects to critical habitat. There will be no change in the miles of other types of roads such as OML 1 or 2, therefore OML 1 and 2 roads are not a factor with this project.

Table Wolf-9: Indicator 5- Miles of Temporary Road Expected Over the Next Twenty Years			
	Data Analyzed	Miles	Percent of Forest Plan FEIS
Expected Condition	Forest Plan FEIS*	898-937	100%
Alternative 1 Existing Condition	2009 M&E Report **	523-628	58% - 67%
Alternatives 2-5	Current Permits and Plans plus 2009 M&E Report**	523-761	58% - 84%
	Future Permits and Plans plus 2009 M&E Report**	532-714	59% - 79%
	Sum of Hardrock DEIS (Current and Future Permits and Plans) and 2009 M&E Report **	532-860	59% - 95%
*Includes planned road decommissioning, temporary, and temporary, and temporary special use permit roads. **Includes planned and completed road decommissioning, temporary, and temporary special use permit roads. Data is from (USDA 2011 - Hardrock Prospecting EIS project file: Road-habitat analysis, temp road effects tab), USDA 2009a, USDA 2004a.			

Discussion: Additional temporary road mileage created under the current applications is estimated to range from no miles to 157 miles in any year depending on the year. Depending on the decision for this project a range of 523 to 761 miles could exist when added to the existing condition (**Table Wolf-9: see Current Permits and Plans and 2009 M&E Report**). This would be a range of 58 percent to 84 percent of the Forest Plan FEIS estimated mileage over the life of the project (USDA 2011).

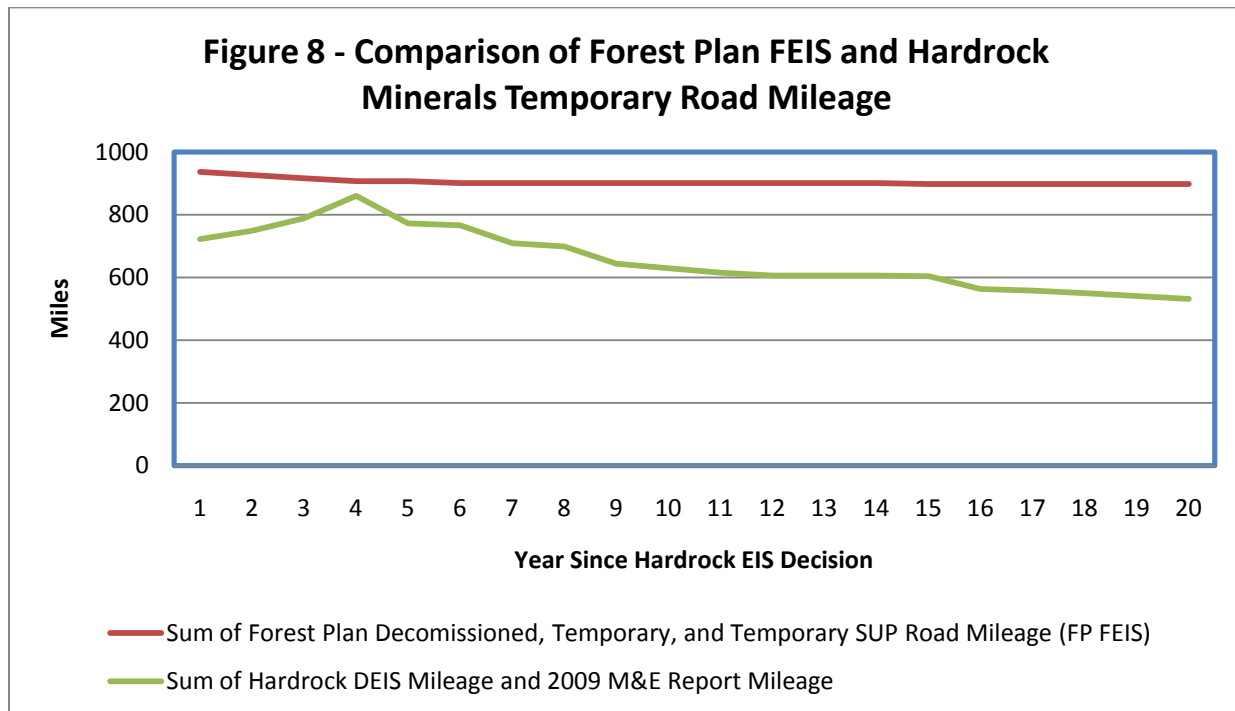
Direct impacts of temporary roads and drill sites would be similar to those roads and landings used in timber sales when constructed (vegetation clearing). Drill sites are expected to have a small footprint on the landscape where they may occur, and temporary roads could vary in length. If these sites left accessible to public use then the risk of human/wolf conflict would increase. The closure of these temporary roads and sites to easy access could reduce the risk of conflict.

The intersections of new, closed temporary roads and roads open to the public are likely to become available as parking areas for 2-4 cars. This may lead to an indirect increase in public access to the lands around drill pads and may increase hunting or human disturbance of wildlife in the area (USDA 2011).

Cumulative effects from temporary roads in the Hard Rock Prospecting EIS project are expected to be greater than from other temporary roads because they may stay open for more years (1 to 15 years) than those predicted by the Forest Plan FEIS for resource management such as timber harvest (1 to 5 years). Maintenance of road closures will be the key to reducing effects to wolf. If road closures do not occur or if they are not properly maintained, wolf mortality, or incidental take, may be expected because of increased human access (USDA 2011).

Alternatives 2-5 temporary road mileage created by current and future applications as well as mileage already on the ground, proposed in other SNF projects, or estimated in the Forest Plan FEIS is estimated to range from 532 miles to 860 miles depending on the year since the decision (Table Lynx-22 and Figure 7)). This would be a range of 59 percent to 95 percent of the Forest Plan FEIS estimated mileage over the life of the project (USDA 2011).

The majority of the temporary road miles (95% of FEIS) are expected to be constructed and used in Year 4 after the Hard Rock EIS decision (Figure 8), and temporary road mileage is expected to decline every year until the project ends. Use of these roads is dependent on exploration activities. This nearly corresponds to Decade 1 estimates in the 2004 BA (USDA 2011).



Cumulatively, if these sites left accessible to public use then the risk of human/wolf conflict would increase with each year. The closure of these temporary roads and sites to easy access could reduce the risk of conflict over the remainder of the Forest Planning cycle.

Forest Plan monitoring has determined the effectiveness of road closure methods used on the Forest to restrict large and small motorized vehicle use (USDA 2009a). The use of these methods on temporary roads for minerals exploration activities could be useful in reducing the risk of human/wolf conflicts.

See **Section 4 – Effects of other Probable Practices on Wolf and Canada lynx** for additional analysis and determinations of effects of Special Use Permit (SUP) roads to gray wolf.

Climate Change

There is no definable Indicator for climate change. As stated in **2.6.1 Affected Environment** the potential implications of climate change to wolf in northern Minnesota are undetermined but continue to be studied. Galatowitsch et al. (2009) discussed potential habitat change scenarios based on an assessment of climate change projections from 16 models. No standard model has been accepted for use in predicting climate change.

For analysis purposes this BA assumes that current weather and habitat conditions will persist through the remainder of the Forest Planning cycle and into the foreseeable future, and that the implementation of the Forest Plan will not influence climate changes at either the global or North American scales.

Discussion: None of the potential projected changes for northern Minnesota are expected to occur within Decade 1 or 2 of the current Forest Planning cycle. How future potential projected climate changes would affect wolf and critical habitat is undetermined at this time. Because of this uncertainty it isn't possible to analyze the impacts of climate change for the remainder of Forest planning cycle.

While the 2004 Forest Plan FEIS (USDA 2004) did not analyze climate change in-depth, the Superior Forest Plan provides the direction that maintains and protects the resistance, resilience and redundancy of lynx and critical habitat during the Forest planning cycle.

At this point in time and for the foreseeable future, the condition of lynx critical habitat on the Superior National Forest is expected to remain suitable, available and well-distributed. No adverse cumulative effects to wolf and critical habitat are expected for the foreseeable future based on climate change.

2.8 Determination of Effects

Refer to Section 1.5 above for explanation of framework for making Determination of Effects to federally listed species and designated critical habitat. Also refer to Table A. in the Executive Summary for a summary of the effects of Revised Plans on gray wolf.

In 2004, the Superior National Forest determined that the Revised Forest Plan may affect, and is likely to adversely affect the gray wolf. The Superior National Forest also determined that the Revised Forest Plan may affect, but is not likely to adversely affect, critical habitat for the gray wolf. The Superior National Forest has not changed these determinations.

Determination of Effect on gray wolves
LAA: May affect, and is likely to adversely affect, the gray wolf.

Determination of Effect on critical habitat
NLAA: May affect, but is not likely to adversely affect, critical habitat for the gray wolf

Rationale for the Determination of Effect

The analysis of effects, based on factors described in **Section 2.5 - Factors Affecting Wolf Environment**, provides the basis for the overall determination of effects on wolf and its habitat. In making the determination of effects, we considered the direct, indirect, and cumulative effects from the following risk factors and/or indicators of proposed management actions:

- ☐ Overall Wolf Management Direction
- ☐ Prey Habitat
- ☐ Human Access and Disturbance

Overall Wolf Management Direction in the Superior Forest Plan

All aspects of NFS proposed management afford special attention to the conservation of wolf. The Revised Plan incorporates integrated resource conservation measures (including management objectives, standards, and guidelines), including applicable measures from the Wolf Recovery Plan, that address conservation of wolf in two important ways:

- ☐ First, the Forest Plan promotes the proactive conservation of wolf and its habitat by a) maintaining or enhancing extensive areas of habitat sufficient or greater than sufficient to support prey base and b) by seeking opportunities to benefit wolf by integrating habitat objectives into plans for the full spectrum of management activities on NFS land. The Revised Plan also promotes maintaining or enhancing the landscape level ecosystems on which this species depends. This direction provides beneficial management to the species in the context of multiple use management for all programs of the Revised Plan.
- ☐ Secondly, the Forest Plan identifies actions to reduce or, where possible, eliminate adverse effects or risks to the species and its habitat that may result from other multiple use management activities and programs. This includes management direction limiting road density on much of the Superior National Forest. This ensures that where possible, potential negative effects “may affect, but not be likely to adversely affect” the wolf.

Although Forest Plan proactively promotes gray wolf conservation and, together with the Wolf Recovery Plan, provides measures to reduce risks to wolf and its habitat, the Forest Plan still has

the potential to affect wolves (mainly individuals, rather than populations) during the life of the Plan (see **Sections 2.7.3 Direct and Indirect Effects** and **2.7.4 Cumulative Effects**).

Considering direct, indirect, and cumulative effects from vegetation management activities and conditions for prey species, the Forest Plan may affect, but is not likely to adversely affect, gray wolf. See discussion under Prey Habitat below. Considering indirect and cumulative effects from management activities and programs for human access and disturbance factors, the Forest Plan may affect, and is likely to adversely affect, gray wolf. See discussion under Human Access and Disturbance below.

Direct Impacts: The potential for direct effects to wolf from both forest vegetation and recreational or road management activities (including Special Use Permit roads) and campsite construction and maintenance, is very low because:

Forest Vegetation Management:

- Overall, given the extensive Superior National Forest acreage, the scattered dispersal of harvest, burning, and other vegetation management activities, management direction to protect known dens, the number of wolf that may be subject to any added stress, displacement, mortality, or other harm is likely to be low.
- Stress from displacement or disruption of use patterns would also likely be temporary. Because of the possibility of disturbance, the Forest Plan provides a management guideline to protect known denning sites during breeding season (G-WL-10). Project level planning and implementation also can better address potential disturbance and strive to avoid any adverse impacts.

Recreation, Roads, Trails Management:

- Given the extensive acreage of Superior National Forest land and dispersal of projects, the likelihood that road and trail construction in relatively narrow bands of forest would coincide with wolf denning is very low.
- Campsite development occurs in very minimal number of acres and thus displacement would likely be minor. Additionally, most sites are adjacent to water (non-habitat) where the presence would be less common (in summer) than in forest.
- In the event that wolf denning is likely in an area (for example, this may be detected by radio-telemetry) or a site is located, mitigations and other protections would be provided through project level planning and implementation.
- The number of wolf, breeding or otherwise, is relatively small and therefore the number of wolf that may be subject to any added stress, displacement, mortality, or other harm is likely to be low.
- Stress from displacement or disruption of use patterns would also likely be temporary.

For these reasons management activities may affect, but are not likely to adversely affect wolf through direct effects.

Prey Habitat

For this factor, the Forest Plan may affect, but is not likely to adversely affect the wolf. Potential effects are expected to be discountable, insignificant, or completely beneficial.

Determination of Effect for prey habitat and vegetation management activities is based on information and analysis in:

- Section 2.6.3 - Indicators 1 (acres of young upland forest habitat for deer, moose, and beaver) and 2 (acres of upland conifer cover for deer and moose)
- Section 2.7.3 - Direct and Indirect Effects
- Section 2.7.4 - Cumulative Effects for these indicators

The Forest Plan may affect wolf, but those impacts are likely to be insignificant, discountable, or beneficial. This is because:

- Overall positive trends of wolf populations on Superior National Forest land provides evidence of success at generally attaining or exceeding population objectives.
- Past history of implementing conservation measures indicates that they are successful in providing more than sufficient habitat for the wolf's primary prey species.
- The overall trend for prey habitat indicates that the Forest Plan is likely to provide for ample, more than sufficient young forest and conifer cover to provide for prey species.
- On a larger landscape level, prey habitat is also likely to be more than sufficient because conditions for young forest and aspen forest would continue to be present in amounts greater than would be expected under RNV.

Human Access/Disturbance

Overall for this factor, the alternatives may affect, and are likely to adversely affect the wolf, even though some aspects may be not likely to adversely affect wolf.

Determination of Effect for activities and programs that result in human access and disturbance is based on information and analysis in:

- Section 2.7.3 - Indicators 3 (proposed miles of RMV trails), 4 (cross-country use policies for use of RMVs), and 5 (miles of temporary and OML 1 roads).
- Section 2.7.3 - Direct and Indirect Effects
- Section 2.7.4 - Cumulative Effects

On the Superior National Forest, based on NFS management, human access, and concomitant potential for human disturbance, there will be a slight increase in low standard roads, and a maximum of up to 90 miles of new ATV and 130 miles of snowmobile (Table Wolf-6) above existing levels based on increases of OML 1 and temporary roads (Tables Wolf-8).

The potential increase in human disturbance on the Superior National Forest has the potential for indirect effect of increasing human disturbance. This could also lead to direct losses due to shooting, trapping or vehicle collisions. Past documentation of wolf kill or harm from shooting, trapping, or collision indicates that these do occur in wolf habitat. From a cumulative effects

standpoint, vehicle collisions, especially, may become an increasing threat. This is both because of increasing numbers of people visiting and recreating in the Superior National Forest (more roads, traffic) and because of increasing deer populations with a result of increasing numbers of deer-vehicle collisions with wolves feeding on the roadside carrion.

Although the Forest Plan is likely to adversely affect wolf at the programmatic level, project level planning, analysis, and implementation should be able to reduce potential negative impacts.

Critical Habitat

Through proposed vegetation management (timber harvest, prescribed burning, and other vegetation treatments), the Forest Plan would promote the maintenance or development of space, food, and cover sufficient or greater than sufficient to assure adequate habitat for survival of the wolf. In addition, the Forest Plan does not promote permanent conversion of vegetative habitat through development to non-habitat, except on the relatively few acres where roads, campsites, or other minor developments may be constructed. Plans would promote limitations on road density in critical habitat along with effective road closures and monitoring across the Forests. Therefore, implementation of the Forest Plan is not likely to adversely affect designated critical habitat.

Mitigations

No mitigation measures are recommended for gray wolf at the Forest Plan level. This is because management direction in the Forest Plan has incorporated strategies for conserving threatened and endangered species and the habitats upon which they depend. These include measures that serve to mitigate or eliminate potential adverse impacts. See section 2.7.2 of this Biological Assessment: Resource Protection Measures, for a list of the Standards and Guidelines. Because it is impossible to provide management direction that would address all possible actions, in all locations, across the broad range of gray wolf on the Superior National Forest, it will be imperative that project level analyses and design be completed for all actions that have the potential to affect gray wolves. Circumstances unique to individual projects or actions and their locations may still result in adverse effects. In these cases, additional or modified mitigating measures may be necessary to avoid or minimize the adverse impacts.

Monitoring and Research

Chapter 4 in the Revised Plan describes the *broad, strategic guidance* for monitoring and evaluation required by federal regulations found in 36 CFR 219 (see Revised Plan, Chapter 4). Broad strategic guidance for gray wolf addresses the monitoring questions:

- To what extent is Forest management contributing to the conservation of threatened and endangered species and moving toward short term (10-15 years) and long-term (100 years) objectives for their habitat conditions and population trends?
- To what extent is Forest management moving toward short term (10-15 years) and long-term (100 years) objectives for habitat conditions for management indicator species and species associated with management indicator habitats?
- What are the population trends of management indicator species?

Monitoring of the gray wolf is conducted through a collaborative effort in which the Superior National Forest relies greatly on the Minnesota Department of Natural Resources (MN DNR) and US Fish and Wildlife Service. Because monitoring Minnesota's wildlife is a collaborative effort, it is not specific to the proclamation boundary of the Superior National Forest. Nevertheless it is an applicable basis for Superior National Forest evaluation of impacts of management. The Superior National Forest anticipates continued cooperation with Fish and Wildlife Service, US Geological Survey and MN DNR to monitor and assess wolf recovery.

The three main sources of population data for gray wolf on the Superior National Forest are the MN DNR statewide wolf monitoring, the US Geological Survey long-term monitoring of radio-collared wolves in Superior National Forest and the Superior National Forest project-specific inventory and monitoring. Minnesota DNR has monitored statewide wolf distribution and abundance since the late 1970s. Since 1970, the survey methods have remained relatively consistent, using several combined sources of data. Previous surveys have taken place at 10 year intervals (1978-79, 1988-89, and 1997-98). However, in anticipation of a federal de-listing proposal in 2004, the survey interval was lowered to five years (2003/2004 and 2007/2008). This monitoring frequency is consistent to what was anticipated in the 2004 BA; specifically, it was anticipated that monitoring and reporting frequency for gray wolf populations would be at least once every five years for the life of the Plan, with a moderate degree of precision and reliability.

Superior National Forest field staff contributed observation information to all surveys. The MN DNR used this information, along with other wolf and deer data, to estimate the total wolf range, total occupied range and the wolf population within the state of Minnesota. More information on the methods that were used is available online at the following address:

http://files.dnr.state.mn.us/fish_wildlife/wildlife/wolves/2008_survey.pdf

In an exception to the broad strategic approach, Chapter 4 also provides more specific guidance for the monitoring the implementation, effectiveness, and validity of Recreation and Transportation System standards and guidelines for road closures. This is included in Chapter 4 rather than just the Procedural Guide or Annual Monitoring Strategy (see below) to ensure this continues to receive a very high priority because of its crucial importance for all threatened species conservation on the Superior National Forest. Chapter 4 provides specific guidance to monitor objectives, standards and guidelines that address effective closure of roads: G-RMV-4, O-TS-3, O-TS-7, S-TS-3, S-TS-7, G-WL-7, and G-TS-12 (See **Section 2.7.2 Resource Protections** above).

Monitoring Question:

- To what extent are road and trail closures effective in prohibiting unauthorized motor vehicle use?

In the 2004 BA, it was anticipated that monitoring frequency for effectiveness of road and trail closures would be on an annual basis, with a moderate degree of precision and reliability and the reporting frequency would be at least once every five years for the life of the Plan.

Refer also to Lynx Sections **3.6.2.2 - General Effects** and **3.6.3 – Direct and Indirect Effects** for monitoring of “no net increase” of designated snow-compacting trails. This should also address concerns for wolves.

More specific technical guidance on monitoring methods will be outlined in a Procedural Guide. This Guide will describe how to accomplish the monitoring prescribed in the forest plan and provide the specific methods, protocols and analytical procedures. The direction in the procedural guide can be modified in response to new information, updated procedures, emerging issues, changes in policy, and budgetary considerations without amending the Plan.

The 2004 BA stated that the Superior National Forest will provide an Annual Monitoring Schedule that will identify precisely what will be monitored, where, when, and by whom for the current or upcoming year. The AMS will be tied to the forest plan and monitoring guide.

The Superior National Forest compiles an Annual Monitoring and Evaluation Report which summarizes results of monitoring efforts. Annual Monitoring Reports are published on the Superior National Forest website (USDA Superior National Forest website: accessed December 13, 2010). The Superior National Forest continues to collaborate with U.S. Fish and Wildlife Service, MN DNR, and other agencies, governments, and public to ensure appropriate monitoring.

Population

Wolf populations have and will continue to be monitored throughout the entire planning period. The wolf is also a “management indicator species” under the National Forest Management Act regulations (NFMA 36 CFR 219.19) (Final EIS Chapter 3.3.4.3). Population monitoring is required for management indicator species.

Guidance for monitoring comes currently from the Wolf Recovery Plan (USDI 1992) and could come in the future from the Minnesota Wolf Management Plan (MN DNR 2001). Both plans call for continued use of surveys, indices, models, and anecdotal information from the field from natural resources management agencies to help assess the abundance and distribution of wolves. Forest Service personnel are involved with these efforts, particularly in reporting, scent post survey, and increasingly, track surveys.

The Recovery Plan calls for a repeated effort on a five-year interval. Past Minnesota DNR efforts occur every 10 years. Under their plan, the Minnesota DNR would reinitiate monitoring the first year of wolf management and each five years thereafter. In anticipation of de-listing, Minnesota DNR initiated the 5 year monitoring schedule this year (2004) (Office Memorandum, J.Erb, 2003). Monitoring methods would be enhanced when possible. Monitoring includes methods such, population modeling, and other currently used annual indicators such as depredation trapping activities and complaints, autumn scent station surveys, winter furbearer track surveys, and observations from field personnel of all natural resources agencies.

Both plans call for radio telemetry in sample study areas. The Minnesota plan would emphasize areas of wolf population concerns, such as where conflicts with humans are likely. Telemetry could be carried out by any responsible and permitted agency.

U.S. Geological Survey research and monitoring has been ongoing since 1966 in a 2,060 km² census area in the middle of the Superior National Forest (this represents five percent of all the

wolf range in Minnesota and 17 percent of the Superior National Forest). The project area includes some lands within the Boundary Waters Canoe Area Wilderness. Wolves are live-trapped and radio-tagged during summer and fall, and then aerially observed for their pack sizes during winter. Besides providing population trend estimates, this project is also the basis for a vast amount of information on many aspects of wolf biology, ecology and management impacts. The U.S. Fish and Wildlife Service and Forest Service have supported that study.

The 1992 Recovery Plan directs monitoring wolves in Zone 1 to follow population fluctuations under relatively natural conditions, particularly the Boundary Waters Canoe Area Wilderness. The State plan does not. The U.S. Geological Survey telemetry study, however, continues to provide information on the wolves from that area.

Health

Both the 1992 Recovery Plan and state plan include monitoring the health of wolves. The focus is to be on assessing the incidence of infectious disease and parasites. Tissue, direct exam, and fecal matter would be checked periodically from live and dead wolves by various agencies such as MN DNR, US Geological Survey personnel. Detected anomalies could affect wolf management strategies. The Forest Service personnel and funding are involved in supporting wolf capture and health monitoring within the USGS studies, and in reporting wolf cadavers.

Prey Species

Populations of primary prey species deer and moose also continue to be monitored in cooperation with the Minnesota DNR. Beaver populations are not closely monitored by the DNR, but continue to periodically conduct aerial surveys in the northeast region.

Research

The Minnesota and federal plans each indicate the need for continuing research aimed at wolf population assessment, ecology, behavior, and genetics, along with prey ecology and behavior. Ideally, the research would feed back into better wolf understanding and management. Forest Service has supported US Fish and Wildlife wolf research for years and may in the future.

Section 3.0 – Canada Lynx

3.1 - Background

This section (2004 BA Section 4.1) provides background information on the current scientific and collaborative basis for lynx conservation management on the Superior National Forest. On March 24, 2000, the USFWS listed the contiguous U.S. Distinct Population Segment (DPS) of the lynx as threatened (USDI 2000). This rule was clarified and affirmed by the FWS on July 3, 2003 (USDI 2003). On February 25, 2009 the FWS designated revised critical habitat for the DPS with

Minnesota being one of five units with revised critical habitat (USDI 2009). The majority of National Forest Lands are within the designated lynx critical habitat area.

The Superior National Forest is the only National Forest in Minnesota with critical habitat, and provides important habitat for lynx in the Lake States geographic area. Lynx presence has been verified on the Superior National Forest by the Minnesota Department of Natural Resources (MN DNR 2004), the Natural Resources Research Institute (Moen 2008, 2009, 2009a), the US Fish and Wildlife Service (USDI 2009), and Superior National Forest lynx monitoring (USDA 2009a).

3.1.1 - Key documents guiding lynx conservation on National Forest System lands.

In the 2004 BA (Section 4.1.1) the key documents for guiding lynx conservation on National Forest System lands were described.

Except for the following additions there are no further changes needed for this section. The 2004 Forest Plan Biological Assessment is considered a key document guiding lynx conservation on the Superior National Forest. The 2004 BA developed the model parameters for lynx indicators analysis located in Appendix D. This model has been in use since the 2004.

In addition, the Forest plan record contains a key document describing and outlining the analysis process (excel spreadsheet) to calculate road and trail densities for Lynx Analysis Units (LAUs) on the Forest. This process has been updated several times since 2004, of which the latest version is dated 2010 (USFS 2010). Further updates will be incorporated as they are developed.

Lastly, valuable Canada lynx research has been conducted by the Natural Resources Research Institute of the University of Minnesota Duluth before and since the 2004 BA. Numerous publications on lynx distribution, abundance, habitat use and selection and the monitoring of long-term persistence in northern Minnesota are considered key documents (Moen et al. 2010).

3.1.2 - Purpose and need for changing the current plan to address lynx conservation on National Forest land.

This BA is addressing whether the designation of critical habitat on the Superior National Forest will require changes in the current Forest Plan. The Chippewa NF has no designated lynx critical habitat and is not being assessed in this BA. In the 2004 BA (Section 4.1.2) the rationale was described on the purpose and need for changing the 1986 Forest Plan prior in the revision to address lynx conservation on National Forest land.

In Table Lynx-1, Section 4.1.2 of the 2004 BA the 15 criteria associated with the environmental and management conditions with potential risk to the lynx in the lower 48 states in the National Lynx Biological Assessment (National BA), were addressed (Hickenbottom et al. 1999). In Appendix B, Table B-2 of the 2004 BA that shows how the Revised 2004 SNF Forest Plan fully meets the evaluation criteria of the National BA, and the Lynx Conservation Strategy and Assessment (LCAS) (Ruediger et al. 2000) (renewed October 20, 2006).

Since 2004 there has been no new or revised lynx conservation direction with the exception of the designation of critical habitat on February 25, 2009. The Superior National Forest has not

received any additional special management considerations or protections from the FWS during project consultation beyond what is contained within the existing 2004 Forest Plan. To date no recovery plan has been developed for the species.

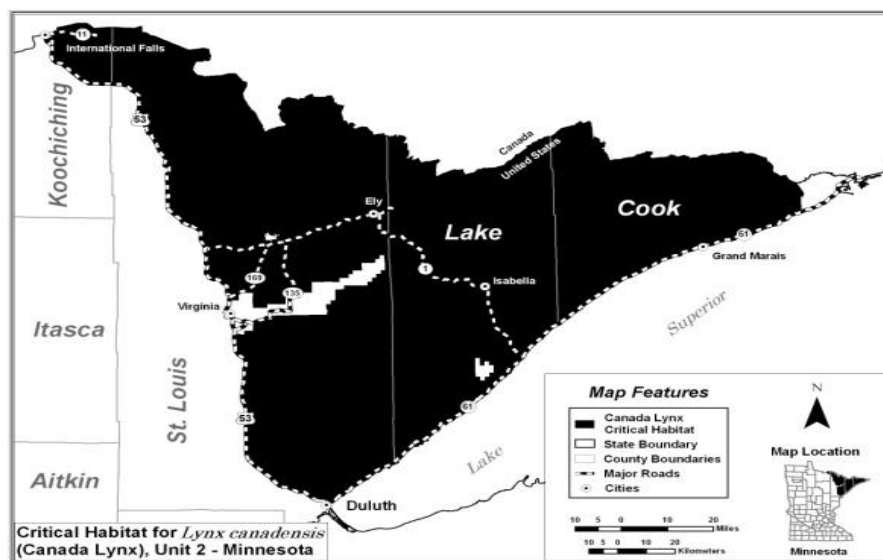
3.2 - Critical Habitat

When consultation was conducted on revised Forest Plan critical habitat for Canada lynx had not been designated by the FWS (2004 BA Section 4.2). *Critical habitat* is a term defined in the Endangered Species Act (ESA). It identifies geographic areas containing features essential for the conservation of a threatened or endangered species and may require special management considerations or protection. Both the 2004 Revised Forest Plan and USFWS Biological Opinion (BO) recognized the importance of critical habitat and addressed the need for further consideration should critical habitat be designated. This was discussed in these portions of these documents.

1. USFWS BO: Reinitiation - Closing Statement (page 42)
2. 2004 Forest Plan: New Information - How Forest Plan Lynx Conservation Approach Will Be Updated. Designation of Critical Habitat (Forest Plan Appendix E, page E-3)

On February 25, 2009 the USFWS designated revised critical habitat for the Distinct Population Segment (DPS) with northeastern Minnesota (Unit 2) being one of five units with revised critical habitat (see Figure 1). Unit 2 is located in northeastern Minnesota in portions of Lake, Koochiching, Cook, and St. Louis Counties, which includes the majority of the Superior National Forest. An overall area of federal, state and private lands of 8,226.1 sq. miles was proposed for designation. Areas of 78.2 sq. miles were excluded leaving 8,065.1 sq. miles being designated (USDI 2009). Of this the majority of National Forest Land is within the lynx critical habitat area.

Figure 1 - Critical Habitat for Canada lynx in Unit 2 – Minnesota.



Excluded areas include a mining district in northeastern Minnesota known as the Iron Range because this area does not contain the biological and physical features essential to the conservation of lynx. The USFWS has stated that in much of the Iron Range mining has removed all vegetation and much of the affected area is flooded. Remaining areas that are still vegetated and not flooded are extensively fragmented by the mined areas and by haul roads. Additional areas disturbed by mining were identified and are not included in the final designated habitat (USDI 2009).

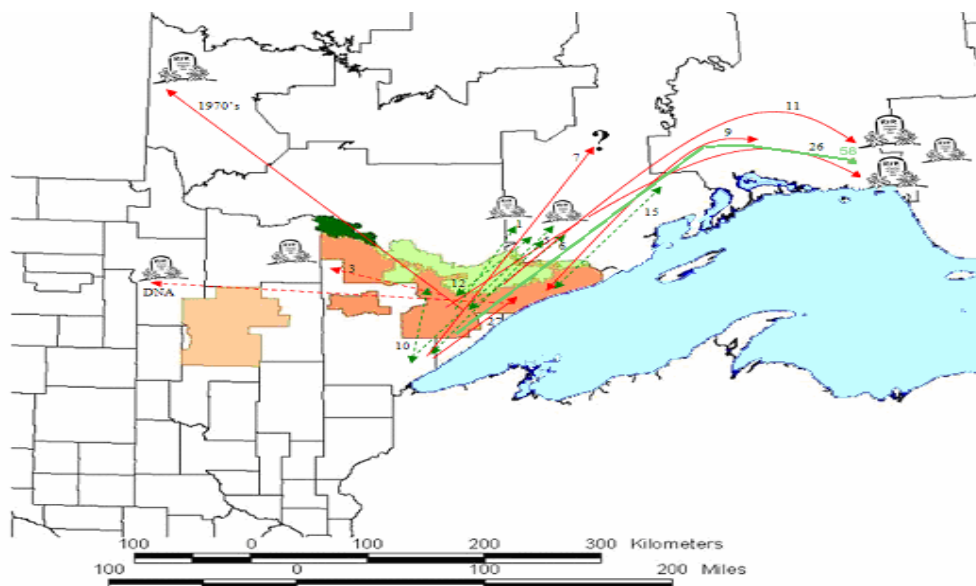
3.3 - Lynx Ecology

This section (**2004 BA - Section 4.3**) discusses information on lynx ecology that is relevant to the discussion of risk factors and management concerns described in Section 3.5 (2004 BA - Section 4.5). New information on the species ecology is available from that discussed in the 2004 BA. Since 2003 the Natural Resources Research Institute (NRRI) in Duluth, MN has been studying the distribution, abundance, persistence, and habitat use of Canada lynx in northeastern Minnesota. NRRI researchers have placed radio collars on 33 lynx, obtained over 15,000 lynx locations, located dens, and documented movements and habitat use. Annual reports, publications, and theses have been produced on lynx ecology in northeastern Minnesota (NRRI 2010).

3.3.1 - Home Range and Dispersal

The information in the 2004 BA (**Section 4.3.1**) on lynx home range and dispersal remains valid, however new information for northeastern Minnesota is available based on research since 2004. Research conducted by the Natural Resources Research Institute (NRRI) in (Burdett 2007 and Moen et al. 2010) indicate that lynx have varied home ranges, and disperse from them within the Superior National Forest, and to and from Canada (see Figure 2).

Figure 2 – Lynx Movement Patterns



Burdett (2007) determined male lynx home ranges varied between 11 and 201 sq. mi., and female lynx home ranges varied between 2 and 37 sq. mi. annually and during the breeding season. These home ranges varied during the breeding season for both male and female lynx with male lynx expanding their home range apparently in search of females, while female lynx contracted their home range when the birthing period approached. Most female lynx were reproductive individuals with reduced movements, whereas males ranged widely between Minnesota and Ontario.

Moen et al. 2010 has shown that in Minnesota lynx disperse outside their home range and between Ontario, Canada and Minnesota. About 40% of radio-collared male and female lynx made long-distance movements outside of their home range. Not all radio-collared lynx made long-distance movements, but of those that did females tended to move 62 to 124 miles (100-200 km) and not return to their original home range, while males moved 31 to 49 miles (50- 80 km) and went back and forth between Ontario and Minnesota (Moen 2009). Movements were made across roaded areas, and also across the Boundary Waters Canoe Area Wilderness (BWCAW) which has few linear features such as roads, trails, and logging roads that could guide movement by lynx. When lynx made long distance movements, they often crossed several Lynx Analysis Unit (LAU) boundaries without changes in direction (Moen et al. 2010).

The relatively linear travel of lynx while on long-distance movements may be due to the lack of topographic relief in Minnesota. Lynx on long-distance movements do not encounter the extreme topography found in mountainous western areas. While topographic features may influence lynx movements in western states, lakes do not appear to influence lynx movements in the northeast Minnesota and Ontario study area. GPS locations show that nearly straight-line paths suggest that water is not avoided and indicate that lynx walk around lakes while on long-distance movements (Moen et al. 2010).

This study indicates that habitat connectivity does not appear to be a factor in northeastern Minnesota. The combination of low topographic relief, the linear nature of movement paths, and the relative lack of differences in cover conditions indicate that geographically or topographically definable movement corridors do not exist for lynx to move either within in northeastern Minnesota, nor between Minnesota and Ontario (Moen et al. 2010).

An indirect effect of long-distance movements can be that some lynx are legally harvested in Ontario (USDA 2010). This harvest is beyond the jurisdiction of the ESA, and has little effect on the population of Canada lynx in Ontario. However, harvest in Ontario can affect the relatively small Minnesota population of Canada lynx as indicated by lynx mortality reports (Moen 2009).

3.3.2 - Diet

The information in the 2004 BA (Section 4.3.2) on lynx diet generally remains valid with the exception that new information is available on the role of red squirrel in lynx diet based on research in northeastern Minnesota and northwestern Montana since 2004.

Research conducted by the Natural Resources Research Institute (NRRI) indicates that the red squirrel is not an important prey species for lynx in northeastern Minnesota (Burdett 2007, and Hanson and Moen 2008). Burdett (2007) states..."In northern Canada, red squirrels (*Tamiasciurus*

hudsonicus) are an important alternate prey species for lynx when hares are scarce (O'Donoghue et al. 1998a), but lynx in my study area rarely preyed on red squirrels, similar to lynx in Montana (Squires and Ruggerio 2007). My results suggest that red squirrels or their habitat have little effect on the distribution of lynx in Minnesota.”

Squires and Ruggerio (2007) found that while red squirrel were the second most common prey in lynx winter diets the red squirrel only comprised two percent of the winter diet in northwestern Montana. The authors concluded that red squirrel contributed little to lynx diet and that lynx made little use of alternative prey species other than hares.

Hanson and Moen (2008) investigated the winter diet of Canada lynx in northern Minnesota examining prey remains present in lynx scat. Snowshoe hare (*Lepus americanus*) remains were present in 76% of lynx scats. If scats only containing white-tailed deer (*Odocoileus virginianus*) hair was found were eliminated, snowshoe hare remains were found in 97% of scats. The study indicates that alternative prey are an insignificant component of Minnesota lynx diets in winter, and no red squirrel remains were found in the analysis.

Forest Plan direction (Appendix E) was developed based on the premise that red squirrel was a key alternate prey species as indicated in the LCAS and the 2004 BA. Management direction in the Forest Plan includes landscape ecosystem objectives and other vegetation management direction in the 2004 BA (Appendix D). Research indicates that red squirrel is not a key alternate prey species.

3.3.3 - Den Site Selection

The information in the 2004 BA (Section 4.3.3) on lynx den sites generally remains valid with the exception that new information is available based on research in northeastern Minnesota since 2004. Recent research conducted by the Natural Resources Research Institute (NRRI) indicate that den sites of radio-collared lynx from 2004 to 2007 had some similarities and differences with den sites in the western USA (Moen and Burdett 2009). Den sites in Minnesota were mostly found in blow-down areas. Like lynx den sites located in other areas, dense vertical and horizontal cover is also key factors and often provided by the tops of trees in Minnesota. In western areas dominated by mature forests and harvested areas, lynx tended to use older forests for denning.

In Minnesota female lynx appear to use a habitat mosaic that includes both foraging habitat and cover for denning. Den sites were often associated with wetland areas where dens were located on small patches of upland surrounded by wetter low-lying areas. Moen and Burdett (2009) speculated that shallow soils in the low-lying areas may increase the chance that wind throw would occur and provide suitable denning cover. Lynx appear to be adaptable in the selection of habitats to den in, but select specific types of areas based on the prevalence of blown down timber.

3.3.4 - Mortality

The information in the 2004 BA (Section 4.3.4) on lynx mortality generally remains valid with the exception that new information is available based on research and monitoring in northeastern

Minnesota during the last 10 years (2000-2010). Since 2000 an incidental take database is currently maintained by the Twin Cities Field Office of Region 3 of the USFWS (USDI 2010). The known lynx mortality from 2000-2010, due to various causes and trapping, is shown in Tables Lynx-1 and Lynx-2 (USDA 2010).

Table Lynx-1: Known incidental take in Minnesota, 2000-2010			
	Mortality	Released Alive	Total
Railroad	2	0	2
Road	7	0	7
Trapped	10*	10	20
Shot	7	0	7
Unknown	13	0	13
Total	39	10	49
*Four of these incidents were legal take in Canada			

Table Lynx-2: Known trapping incidents in Minnesota, 2000-2010			
	Mortality	Released Alive	Total
Body grip	0	2	2
Leg hold	1	4	5
Snare	5	4	9
Unknown (legal take in Canada)	4	0	4
Total	10	10	20

Research conducted by the Natural Resources Research Institute (NRRI) between 2003 and 2009 (Moen 2009) indicates that the causes of lynx mortalities vary, with 15 of 19 deaths probably or known to be directly or indirectly associated with human activities (USDA 2010).

Many resident lynx that make movements into Ontario are harvested, particularly those that go long distances. Three radio-collared animals made 300-400 road mile movements to same area in Ontario (USDA 2010). Legal harvest in Ontario is attributed to 4 of 19 deaths, and at least 2 more animals have died in Ontario (6 of 19 known mortalities). Lynx that conduct long-distance movements from Minnesota to Ontario are vulnerable to legal harvest on Canada whereas trapping mortality in Minnesota is incidental to trapping for other species since there is no legal trapping of lynx in the USA (Moen 2009). Moen et al. (2010) indicates that linear features such as roads benefit lynx from an energetic perspective, but may also be negative if they increase the chance of incidental mortality because of exposure to humans.

Figure 2 on page 49 (Moen et al 2010) indicates that some lynx have left the Superior NF area and have died elsewhere off NFS lands due to legal trapping in Canada, or other causes.

3.3.5 - Inter-Specific Relationships with Other Carnivores

The information in the 2004 BA (Section 4.3.5) on inter-specific relationships that lynx have with other carnivores generally remains valid with the exception that new information is available based on research and monitoring in northeastern Minnesota since 2004. Research conducted by the Natural Resources Research Institute (NRRI) since 2004 indicates interactions between lynx and bobcats. The range of bobcat overlaps that of lynx in the state (<http://www.dnr.state.mn.us/mammals/bobcat.html>). Swartz et al. 2004 demonstrated that Canada lynx and bobcats hybridize in the wild. It was verified that three lynx from Minnesota contain DNA from both bobcats and lynx. Hybridization may be an under-appreciated factor that could

limit the distribution and recovery of lynx. The presence of lynx/bobcat hybrids could become a new factor in the population management of both species with potential implications for hunting and trapping of bobcats.

3.3.6 - Population Dynamics

The information in the 2004 BA (Section 4.3.6) on lynx population dynamics generally remains valid with the exception that new information is available based on research and monitoring in northeastern Minnesota since 2004.

The Natural Resources Research Institute (NRRI) has investigated aspects of lynx population dynamics in northern Minnesota. These include; 1) survival and mortality of adult and sub-adult lynx, 2) reproduction, and 3) persistence in Minnesota. Moen 2009 discusses these aspects as well as the potential future of lynx in Minnesota based on finding to date. Key points are: 1) Causes of lynx mortality varies with the majority of known deaths being known or probably directly or indirectly associated with human activities both in Minnesota and Canada (See **Section 3.3.4**), and 2) given the low densities of Canada lynx in Minnesota, it is impossible to provide an accurate population estimate.

Also while reproduction occurs in Minnesota, the relative lack of recruitment of kittens into the adult population does not support the hypothesis of a resident population. In the past six years of telemetry work, there have been an estimated 40-50 known kittens born in Minnesota. Very few (2 or 3) of these have survived past 2 years old. Collars on a few kittens indicate that human-associated mortality is known or likely. Starvation mortality is not a major factor. In contrast, the study is approaching 5 years of survival for one study animal. (33 animals have been collared during the 6 year study. Two are still on the air with VHF collars and are monitored bi-weekly (USDA 2010).

Based on these research conclusions and the known movements of lynx between Minnesota and Ontario, indicates that lynx population dynamics in southern Canada are key to continued lynx persistence in northern Minnesota.

3.4 - Population Status

This section summarizes lynx population status and distribution at three landscape scales: North America, Minnesota and the Superior National Forest.

3.4.1 - North America

This section summarizes the population status and distribution of lynx at three landscapes scales: North America, Minnesota, and the Superior National Forest. There is no change in this section compared to the information discuss in the 2004 BA (**Section 4.4.1**).

3.4.2 - Minnesota and the Superior National Forest

3.4.2.1 - Information on Minnesota populations prior to 1999.

There is no change in this section compared to the information discuss in the 2004 BA (Section 4.4.2.1).

3.4.2.2 - Information on Minnesota populations from 1999 to present.

The information in the 2004 BA (Section 4.4.2.2) on lynx populations generally remains valid with the exception that new information is available based on research and monitoring in Minnesota, and changes in lynx data management since 2004.

From 2000-2006 the Minnesota Department of Natural Resources (MN DNR) maintained a database of verified and unverified lynx sightings. The link to the MN DNR website is: http://www.dnr.state.mn.us/eco/nhnrp/research/lynx_sightings.html. Due to budgetary and staffing constraints MN DNR stopped maintaining this database in 2006. Ron Moen, with Natural Resources Research Institute (NRRI) still collects sightings information via phone and through a website. However, this information is no longer made available to the public. The link to the NRRI website is: <http://www.nrri.umn.edu/lynx/index.html> (USDA 2010).

3.4.3 - Minnesota's Lynx-Hare Cycles

The information in the 2004 BA (Section 4.4.3) on lynx-hare cycles generally remains valid with the exception that new information is available based on research and monitoring in northeastern Minnesota since 2004. The following research was conducted by the Natural Resources Research Institute (NRRI) from 2006 to 2009, and has indicated that snowshoe hare are the key prey item for lynx in northeastern Minnesota.

Research in northeastern Minnesota has used snowshoe hare pellet counts, GIS, and satellite imagery to study lynx-hare cycles and lynx habitat use (Burdett 2007, McCann 2006 and Moen 2009). Hanson and Moen (2008) found that lynx diet in the winter months in northeastern Minnesota was predominantly snowshoe hare, consistent with Canada lynx diets throughout North America. Burdett (2008) also found that snowshoe hare comprised 92% of predation events from predation sites found while snow-tracking in Minnesota.

McCann (2006) found that pellet counts are a useful method to estimate hare densities. NRRI has collected seven years worth of hare pellet count data from Minnesota. The data shows that over the past 7 years pellet densities have remained stable with no large amplitude fluctuations. This data also shows that hare pellet density in Minnesota is 10%-25% of hare pellet density in Ontario. This data appears to indicate that snowshoe hare are not as cyclic as hare populations in Canada. This appears to correlate with older studies that indicate that fluctuations in lynx populations in Minnesota are not as prey dependant as in Canada, but are influenced by emigrants from Canada.

Based on these results NRRI is developing a non-permanent plot method to estimate snowshoe hare density at the landscape level, and to better understand the lynx-hare cycle in northeastern Minnesota (Moen et al 2009, USDA 2010b).

3.5 - Factors Affecting Lynx Environment and Analysis Indicators

This section (**2004 BA Section 4.5 p.98**) summarizes key risk factors affected by National Forest management and describes indicators selected to analyze these risks in the Superior National Forest - Forest Plan. It briefly describes and reviews risks identified in the LCAS that were not analyzed in detail in 2004 because they were not applicable, are not under Forest Service control, or would be very minor on the Superior National Forest.

This section will also discuss research findings and any needs for change as they apply to Analysis Indicators since 2004, and a Lynx Analysis Indicator Crosswalk to Primary Constituent Elements of Critical Habitat that were not in the 2004 BA.

3.5.1 - Overview of Risk Factors and Analysis Indicators

In the 2004 BA (Section 4.5.1) the key potential risk factors to lynx were described briefly, but which were identified, defined, and described in detail in the LCAS (Ruediger et al. 2000, Chapter 2) and the National Lynx Biological Assessment (Hickenbottom et al. 1999). These risk factors, that include the programs, practices, and activities that may directly, indirectly, or cumulatively influence lynx or lynx habitat in four areas, have not changed.

1. Productivity - Timber Management, Wildland Fire Management, Recreation, Human Development
2. Mortality – Trapping, Predator Control, Competition and predation as influenced by human activities, Highways (vehicle collisions)
3. Movement and Dispersal - Highways, railroads, utility corridors, Land ownership pattern, Ski areas and large resorts
4. Other large Scale Factors - Fragmentation and degradation of lynx refugia, Habitat degradation by non-native invasive spp.

This BA reviews and updates the measureable indicators in same categories as in the 2004 BA.

1. Section 3.5.3 – Productivity and Movement: Lynx Habitat – Forest Condition
(**Section 4.5.3 in the 2004 BA**)
2. Section 3.5.4 – Productivity, Mortality, and Movement: Human Disturbance
(**Section 4.5.4 in the 2004 BA**)

Table Lynx-3 displays the LCAS risk factors and the indicators from the 2004 BA. The relationships and descriptions are found in **Sections 3.5.2, 3.5.3, and 3.5.4.**

Table Lynx-3. LCAS Risk Factors to Lynx and its habitat, and selected analysis indicators for this Reconsultation Biological Assessment compared to the 2004 Biological Assessment								
	Lynx Habitat – Forest Condition			Human Disturbance			Other	
Indicator LCAS Risk Factors	1a Snowshoe hare habitat	1b Unsuitable habitat	3 Denning habitat	4 & 5 ATV & snowmobile trails	6 Low std & temp roads	7 & 8 ATV & snowmobile policy	No Indicators	
							Connectivity habitat	Not applicable
Factors Affecting Lynx Productivity								
Timber Management	X	X	X	X	X		X	
Wildland Fire Management	X	X	X	X			X	
Recreation				X	X	X		
Human Development	X	X	X	X	X		X	
Factors Affecting Lynx Mortality								
Trapping				X	X	X		
Predator Control						X		
Shooting				X	X	X		
Competition and predation as influenced by human activities				X	X	X		
Highways (vehicle collisions)							X	
Movement and Dispersal								
Highways, railroads, utility corridors							X	
Land ownership pattern							X	
Ski areas and large resorts								X
Other Large-scale factors								
Fragmentation and degradation of lynx refugia							X	
Habitat degradation by non-native invasive spp.					X			
Notes: Lynx Habitat – Forest Condition: Indicator 2 – Red squirrel habitat in the 2004 BA has been dropped. LCAS Risk Factor Indicator - Lynx movement and dispersal across shrub-steppe habitats was deemed not applicable in the 2004 BA.								

3.5.2 - Lynx Analysis Units (LAUs)

The Superior National Forest first established LAUs using the criteria and procedures for lynx habitat mapping developed by the Lynx Science Team and Steering Committee (USDA 2000). In 2004 the LAUs were revised (USDA 2004, 2004c and 2004d) adding LAUs to the Virginia Management Unit of the Laurentian Ranger District, designating the BWCAW as a refugium, refining boundaries of LAUs that overlapped into the BWCAW before its refugium designation, and establishing two LAUs (44 and 46) where connectivity and travel habitat is emphasized. Only one LAU on the Forest lacks critical habitat that being SNF 47 on the far west side, Two other west-zone LAUs are bisected by the critical habitat line to various degrees. These western LAUs also have a high degree of mixed ownership and National Forest lands can be scattered in blocks of various sizes.

3.5.2.1 - Definitions.

The definition of Lynx Analysis Units (LAUs), as described in the Lynx Conservation Strategy and Assessment (LCAS) (Ruediger et al.2000)), and the 2004 BA (Section 4.5.2.1), has not changed. LAUs are the smallest landscape-scale analysis units used to determine direct, indirect and cumulative effect for lynx. LAUs may contain habitat that may or may not provide habitat or environmental conditions necessary to support lynx reproduction and survival. Lynx habitat outside LAUs exists because those areas did not contain sufficient habitat conditions to be viable LAUs (USDA 2000 and 2004d)

3.5.2.2 - Management and Analysis Scale.

There has been no change to the lynx management and analysis scales as described in the 2004 BA (Section 4.5.2.2 p.100). No changes in the use of LAUs as the unit of management and analysis are anticipated in the foreseeable future.

3.5.2.3 - Mapping LAUs on the Superior National Forest.

There is no change to the mapped LAUs on the Superior National Forest as described in the 2004 BA (**Section 4.5.2.3 p.102**). No Lynx Analysis Units (LAUs) have been remapped nor have any new LAUs been mapped since 2004.

The narrow strip of land along the North Shore of Lake Superior lacks LAUs. This area has a high degree of mixed ownerships and National Forest lands are scattered. Habitat conditions along this strip of land can be marginal for lynx due to human developments. Lynx use was not expected to occur in these non-LAU areas however, since 2000 lynx use has been confirmed in some of these areas.

3.5.2.4 - Refining LAU boundaries.

There have been no administrative refinements of LAU boundaries since the 2004 Forest Plan revision. There has been no change in the points made in the 2004 BA (**Section 4.5.2.4 p.102**) nor are any changes anticipated in the foreseeable future.

3.5.2.5 - Coarse and Fine Filter Management in LAU and other Considerations.

The incorporation of both fine and coarse-level management guidance to maintain lynx on National Forest lands, as described in the 2004 BA (**Section 4.5.2.5 p.103**) is still applicable today, and no changes anticipated in the foreseeable future. Habitat on the Superior National Forest is still considered an extension of habitat in Ontario, Canada. Recent research has documented lynx movements back and forth between the Forest and Ontario (Moen et al 2010). **Sections 3.3.1** and **3.6.2.2** of this BA describe the results of lynx movement research since 2004.

3.5.2.6 - Lynx Assessment for Revised Plans.

Forest management actions are accesses primarily at the LAU scale. Annual changes in LAU conditions are summarized at the Forest-wide scale in annual monitoring reports.

3.5.3 Refugium – Boundary Waters Canoe Area Wilderness

The Boundary Waters Canoe Area Wilderness (BWCAW) remains a Refugium habitat for the Canada lynx as designated and discussed in the 2004 Forest Plan Revision and BA (USDA 2004, and USDA 2004b - Section 4.5.3 p.103-104).

Since 2003 the Natural Resources Research Institute (NRRI) in Duluth, MN has been studying the distribution, abundance, persistence, and habitat use of Canada lynx in northeastern Minnesota including the BWCAW. NRRI research has documented movements and habitat use in and through the BWCAW (e.g. Moen et al. 2010). This research is available at the NRRI webpage (NRRI 2010).

3.5.4 – Other Critical Lynx Habitat outside of LAUs

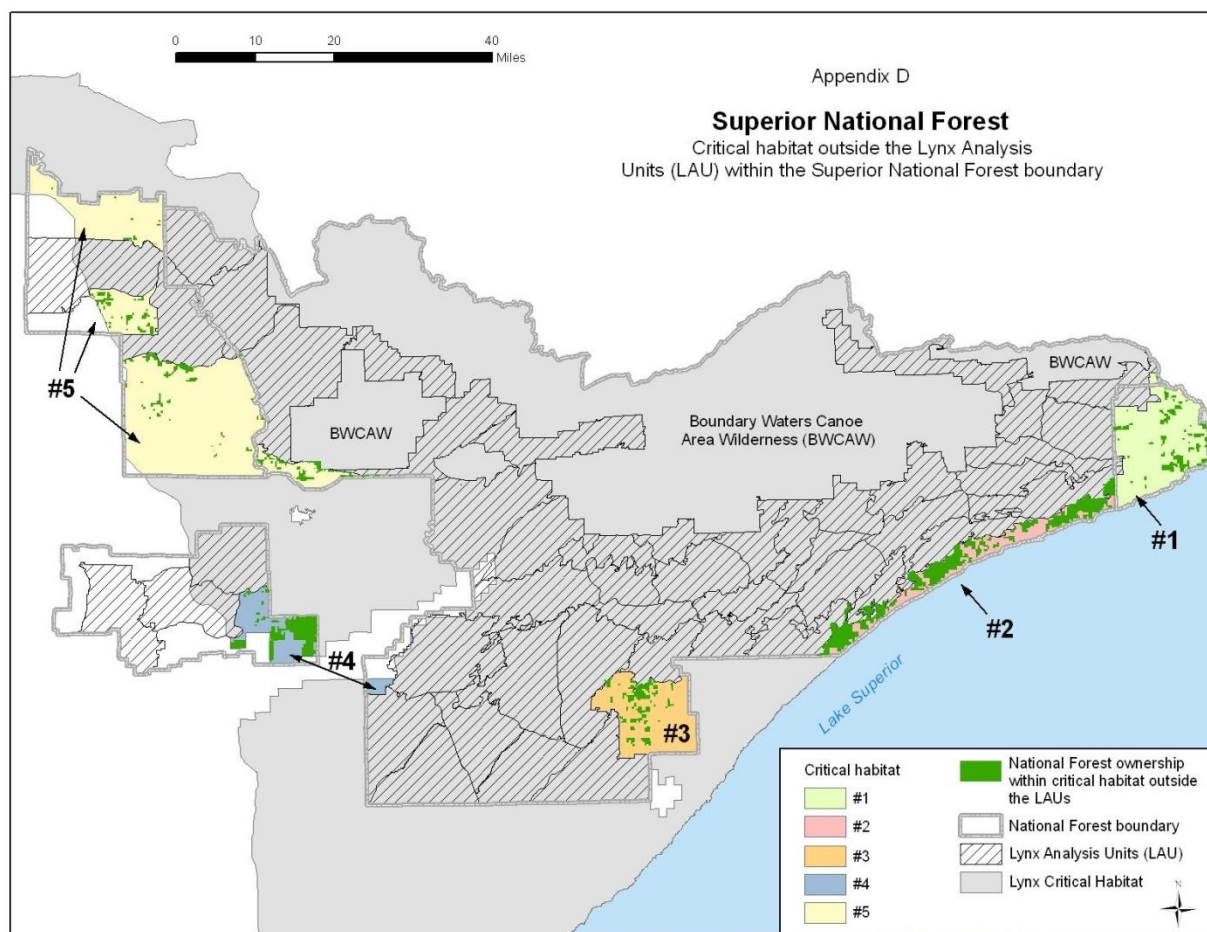
Lynx critical habitat exists outside the 47 LAUs and BWCAW Refugium on National Forest Lands. Pursuant to the Endangered Species Act of 1973 as amended (section 7(a)(2), exceptions to management and analysis at the LAU-scale may also be warranted for some projects where it is determined that lynx may occur in areas outside of mapped LAUs, and where these projects have the potential to affect lynx (USDA 2004).

After the 2004 Forest Plan revision several areas on the Forest remained outside LAUs in areas on the boundaries of the Forest because they did not contain sufficient habitat conditions to be viable LAUs (USDA 2000 and 2004d). Lynx habitat in these areas was determined to be fragmented by mixture of other human developments not under USFS management but adjacent to parcels of National Forest lands that vary in size and distribution. These other human developments include; state, county and private forestlands, state parks, campgrounds, other private land ownerships like rural homes, subdivisions, as well as commercial developments such as resorts, ski areas, mining facilities and pits. These non-LAU areas also contain numerous roads and trails.

Approximately 73,976 acres of NFS lands are outside LAUs but within USFWS-designated critical habitat (Table Lynx-9). Only for analysis and discussion purposes in this BA five areas of non-LAU habitat (NLHs) have been identified (Figure 3) and Table Lynx-9). The US Forest

Service is a minority owner within 4 of 5 of these areas. These non-LAU areas occur on the La Croix, Laurentian, Tofte and Gunflint Ranger Districts. The Forest is not beholding to these designations as they are defined only for this BA. More specific analysis and separate consultations, pursuant to Section 7 of the ESA, would occur at the project-level by the ranger districts if actions are planned in these areas.

Figure 3 – Critical Lynx Habitat outside of LAUs



The East Zone of the Forest contains two areas. Area #1 (85,399 acres) consists of the Pigeon Rover Purchase Unit. This area contains 7,761 acres of NFS lands that are scattered and fragmented and make up 9.1% of the area (USDA 2000, USDA 2011i). Area #2 (63,247 acres) contains 32,670 acres of NFS lands scattered along a narrow strip of land on the North Shore of Lake Superior. US Forest Service lands make up 51.7% of this area because of the high degree of mixed ownerships and human developments (USDA 2000, USDA 2011i). While Superior National Forest lands make up the majority of this area it contains numerous human developments such as motorized and non-motorized recreation trails, as well as winter sports areas, several state parks and private resorts and motels along Highway 61. In addition, winter habitat conditions along this strip of land can be marginal for lynx due to southern exposures and lake-effect warming that creates less favorable snow conditions (USDA 2000).

Since 2000 lynx have transited Area #1 based on NRRI research results, and in Area #2 two lynx were known to use the area around Grand Marais, MN for a time (R. Moen 2011).

The West Zone of the Forest contains three areas with a high degree of mixed ownership and fragmentation of National Forest lands. Area #3 is 66,083 acres in size, and is located east of Cloquet Lake to Highway 1. It contains 7,575 acres of NFS lands that are scattered and fragmented, and makes up 11.5% of this area (USDA 2000, USDA 2011i). Lynx use has been confirmed in this area (USDA 2011g).

Area #4 (41,761 acres) is bisected by the excluded mining area. The 13,253 acres of NFS lands are scattered and fragmented make up approx. 31.7% of this area (USDA 2000, USDA 2011i). The largest portion of NFS lands in this area consists of the Giants Ridge ski area development. Elsewhere, lynx habitat in Area #4 is marginal and fragmented by private ownerships, small farms, subdivisions, rural housing and numerous roads. The smallest portion of Area #4 is almost entirely private land. Lynx use has not been detected in this Area #4. No lynx use has been confirmed in this area (USDA 2011g).

Area #5 (253,765 acres) consists of three subareas in the northwestern portion of the Forest. The 12,716 acres of NFS lands are scattered and fragmented make up approx. 5.0% of this area (USDA 2000, USDA 2011i). This area is fragmented by state, county and private forestlands, small farms, subdivisions, rural housing and numerous roads. Lynx use has been confirmed in some of Area #5 (USDA 2011h).

Forest Plan direction (USDA 2004, pages 2-29 to 2-31) listed in **Section 3.6.2.1 - Resource Protection Methods** applies to lynx habitat outside LAUs, however some objectives, standards and guidelines were developed specifically for LAU management because they incorporate direction from the LCAS (Ruediger et al 2000). There are 10 standards or guidelines for lynx that are LAU-oriented. Five of these relate to measureable analysis indicators (*) to manage for in LAUs. They are;

O-WL-9: In LAUs in NFS land, manage vegetation to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternative prey in sufficient amounts and distributions so that availability of prey is not limiting lynx recovery.

O-WL-10: In LAUs in NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx.

O-WL-11: Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs on NFS land.

***G-WL-3:** Limit disturbance within each LAU on NFS land as follows: if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable conditions should occur as a result of vegetation management activities by the National Forest. *Only LAUs 44 and 46 are exempted from this guideline.*

***S-WL-1:** Management activities on NFS land shall not change more than 15% of lynx habitat on NFS land within an LAU to an unsuitable condition within a 10-year period. *Only LAUs 44 and 46 are exempted from this guideline.*

***G-WL-4:** Within an LAU, maintain or promote well-distributed denning habitat in patches generally larger than five acres, comprising at least 10% of lynx habitat. Where less than 10% of forested lynx habitat within an LAU provides denning habitat, defer those management actions on NFS land that would delay achievement of denning habitat structure. *Only LAUs 44 and 46 are exempted from this guideline.*

***G-WL-5:** Following a disturbance on NFS land greater than 20 contiguous acres (such as blow-down, fire, insect, or disease) that could contribute to lynx denning habitat, generally retain a minimum of 10% of the affected area on NFS land unless salvage or prescribed fire is necessary to address human health and safety (such as in the Wildland Urban Interface) or scenic integrity. *Only LAUs 44 and 46 are exempted from this guideline.*

S-WL-2: In LAUs on NFS land allow no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas.

G-WL-6: Where a designated trail for snow-compacting activities is desired within LAUs, the proposed route should be planned to protect or improve the integrity of lynx habitat and minimize snow compaction in lynx habitat. The trail should be designed to:

- Move recreational use away from more sensitive or better quality lynx habitat,
- Concentrate use within existing developed areas rather than developing new recreational areas in lynx habitat, and or
- Be located within the outer boundaries of a currently used road and trail system.

***G-WL-8:** Within LAUs generally maintain road and snow-compacting trail densities below 2 miles per square mile to maintain the natural competitive advantage of Canada lynx in deep snow. Where the total road and regularly-used snow-compacting trail densities are greater than 2 miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline “roads” include all ownerships of classified and unclassified roads and “regularly-used trails” are those that are used most years for most of the snow-season.

This Forest Plan guidance is the basis of several lynx analysis indicators to address productivity and risk factors for lynx critical habitat in LAUs. Because these five non-LAU areas (NLAs) are not LAUs they are technically exempt from these standards and guidelines. However, for comparison purposes these five non-LAU areas will be assessed using the five standards and guidelines that are measureable analysis indicators (*) in Section 3.6 – Affected Environment and Environmental Consequences for this BA.

3.5.5 Analysis Indicators to address Productivity and Movement Risk Factors: Lynx Habitat – Forest Condition

As in the 2004 BA, this section addresses the identified indicators used to analyze the impacts of those risk factors that have the most substantive impacts on lynx habitat as they relate to forest vegetation conditions.

The indicators identified in the 2004 BA (**Section 4.5.4, p.104**) for Lynx Habitat – Forest Condition remain valid with one exception. There are no changes in the discussion on the Range of Variability (RNV) except for disclosing new information. The discussions on lynx habitat and forest vegetation conditions in the 2004 BA have not changed with one exception. In addition, there has been no change in the description and analysis of the relationship between the vegetation conditions of the Revised Plan and RNV. This reconsultation BA does not address non-habitat that is unsuitable for lynx as did the 2004 BA.

Indicators are used to analyze impacts from those vegetation management practices and/or events that can affect the various types of habitats that support lynx. These types include: total current lynx habitat; non-habitat (not ecologically capable of supporting lynx or its prey currently or in the future); prey habitat (snowshoe hare); currently unsuitable habitat (forest too young to support snowshoe hares); denning habitat, and connectivity habitat.

On NFS lands land management activities and programs that most frequently result in habitat changes include timber sales, prescribed fire and wildland fire, and occasionally human developments.

As in the 2004 BA the analysis indicators are used to compare how the Forest Plan provides lynx habitat through the implementation of relevant conservation measures (e.g. objectives, standards and guidelines).

Range of Natural Variability

The basic principles of Range of Natural Variability (RNV) that were discussed in the 2004 BA (**Sections 4.5.4 and 4.6.3**) and in the Final EIS Chapter 3.2 have not changed. The effects on forest habitat condition continue to be analyzed only for lynx habitat, and not address non-habitat.

Forest Plan vegetation management strategies (direction) were developed with LCAS and the most current RNV science in Minnesota. Vegetation conditions for composition and structure (age) remain within above, or below RNV based on Forest Plan monitoring (USDA 2005, 2006, 2007, 2008 and 2009). This Forest strategy has not changed since 2004, and Forest Plan direction continues to be implemented.

The state of knowledge of RNV in northern Minnesota has continued to evolve as it relates to climate change studies. Galatowitsch et al. 2009 discussed potential habitat change scenarios based on an assessment of climate change projections from 16 models. At this point in time the projected habitats currently exist hundreds of miles away from the Superior NF. None of these potential projections are likely to have a significant impact in northern Minnesota for several decades, which is well outside the current Forest planning cycle (Frelich 2010 pers., comm.).

In the next Forest Plan Revision it is anticipated that relevant RNV science would be reviewed and incorporated into Forest Plan direction. How this affects lynx critical habitat management is undetermined at this time.

3.5.5.1 - Productivity: Forage Habitat (suitable for snowshoe hare and red squirrel)

The information discussed in the 2004 BA (**Section 4.5.4.1, p.107**) is still relevant; except that it has been determined that red squirrel is not a key prey species (See Lynx Ecology - **Section 3.3.2 Diet**).

Indicators selected to address forage habitat: Two indicators were developed in the Forest Plan 2004, and one change is proposed. Appendix D in the 2004 BA describes these model parameters.

Indicator 1a: Snowshoe hare habitat

There have been no changes in how snowshoe hare habitat is analyzed since the 2004 BA. The parameters that define snowshoe hare habitat have not changed, and are described in Appendix D of the 2004 BA.

Indicator 2: Red squirrel habitat. This indicator is proposed to be dropped from further use.

In **Section 3.3.2 Diet**, new information was discussed on the role of red squirrel in lynx diet based on recent research in northeastern Minnesota and northwestern Montana (Burdett 2007, Hanson and Moen 2008, and Squires and Ruggerio 2007). This research concluded that red squirrel contributed little to lynx diet and that lynx made little use of alternative prey species other than hares.

Forest Plan direction (Appendix E, and 2004 BA Appendix D) was developed based on the premise that red squirrel was a key alternate prey species as indicated in the LCAS. Since research indicates that red squirrel is not a key alternate prey species this BA proposes that Forest Plan direction to manage vegetation for red squirrel is not needed. The designation of critical habitat does not change this conclusion.

There has been no need for change in the existing key management direction from the Forest Plan, and the following lynx-specific management direction that is described in the 2004 BA Section 4.5.4.1 on page 106, and in Section 3.6.2.1 of this BA:

O-WL-9: In LAUs in NFS land, manage vegetation to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternative prey in sufficient amounts and distributions so that availability of prey is not limiting lynx recovery.

O-WL-10: In LAUs in NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx.

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx habitat is discussed in Section 3.5.7.

3.5.5.2 - Productivity: Unsuitable Habitat (forest too young to be suitable habitat for snowshoe hare)

There have been no changes in how unsuitable habitat is analyzed since the 2004 BA (**Section 4.5.4.2**). The parameters that define the total forested habitat considered unsuitable for lynx have not changed, and are described in Appendix D of the 2004 BA.

Indicator 1b: Unsuitable habitat

There has been no need for change in the existing key management direction from the Forest Plan. The following lynx-specific management direction is described in the 2004 BA in Section 4.5.4.2 on page 107, and in Section 3.6.2.1 of this BA:

G-WL-3: Limit disturbance within each LAU on NFS land as follows: if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable conditions should occur as a result of vegetation management activities by the National Forest.

S-WL-1: Management activities on NFS land shall not change more than 15% of lynx habitat on NFS land within an LAU to an unsuitable condition within a 10-year period.

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx critical habitat is discussed in Section 3.5.7.

3.5.4.3 - Productivity: Denning Habitat

There is no change in the description and role of denning habitat, and the key management direction discussed and listed in the 2004 BA (**Section 4.5.4.3**), and in Section 3.6.2.1 of this BA. However, new information has become available since the Forest Plan and BA were completed in 2004.

Denning habitat continues to be analyzed as described in the 2004 BA. The types of total forested lynx habitat considered suitable for denning have not changed, and are described in Appendix D of the 2004 BA.

Indicators selected to address denning habitat: One indicator was selected in 2004, and no changes have occurred.

Indicator 3: Denning habitat in patches greater than five acres.

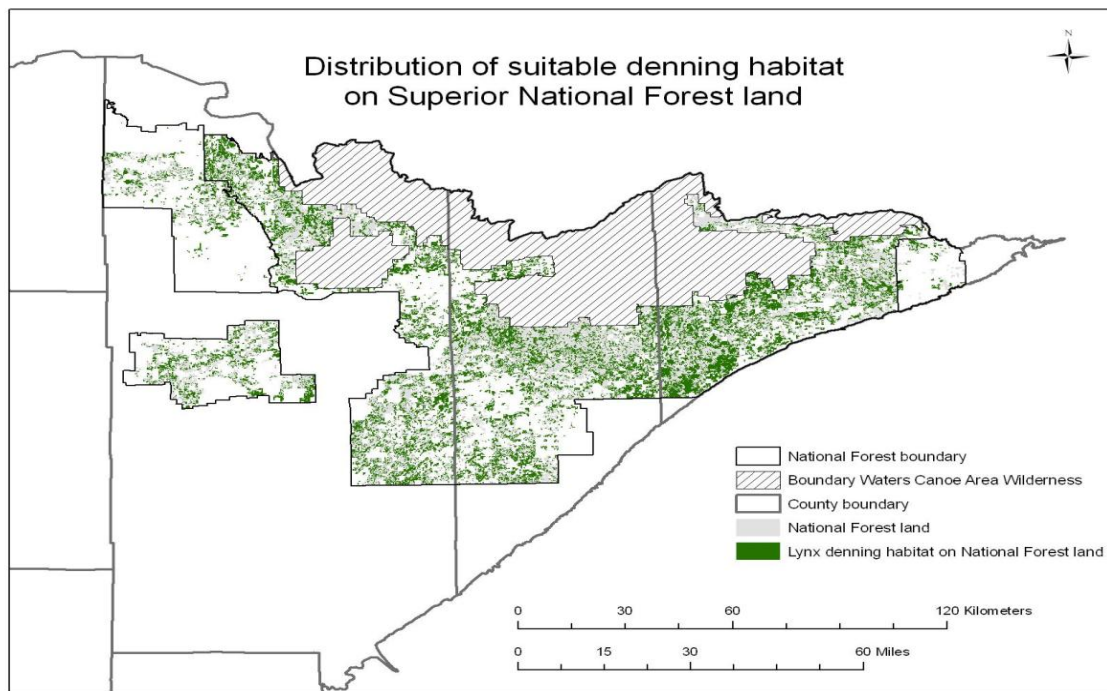
As in 2004, this indicator does not allow specific measurement and comparison of some beneficial features of denning habitat because it is assumed that coarse woody debris, that is a feature of denning habitat, is being provided within older forest stages of total forested lynx habitat (USDA 2004b BA). Moen et al. 2008 provided new information into the characteristics and modeling of potential lynx denning sites in northern Minnesota

Moen et al. (2008) found that all den sites were associated with a downed tree, with disturbance area varying from about 20 square meters (>50 ft²) to greater than 1 ha (2.5 acres). Lynx den sites consistently had lower stem density than the surrounding area, with greater than 80% of tree stems being coniferous species. Lowland conifer and upland conifer cover types made up greater than 70% of area within 100 m of den sites and the percentage of those cover types decreased with greater distance from the den sites.

These findings are consistent with the assumptions made in the 2004 BA that generally suitable denning habitat includes both upland and lowland forest 60 to 80 years old or greater depending on forest type (USDA 2004b).

The protection of den sites (**G-WL-2**) was not assessed in the 2004 BA. At the time there were no known lynx denning sites. Since 2004, lynx denning sites have been confirmed and assessed by Moen et al. (2008) and Burdett (2008). The 2004 BA stated that the protection of denning sites must be examined and applied at the project-level because specific locations cannot be determined at the Forest-level. Denning habitat distribution was modeled using 2004 BA criteria in Appendix D. Figure 4 depicts the distribution of potential denning habitat using US Forest Service criteria.

Figure 4 – Distribution of potential denning habitat – USDA 2004b BA criteria



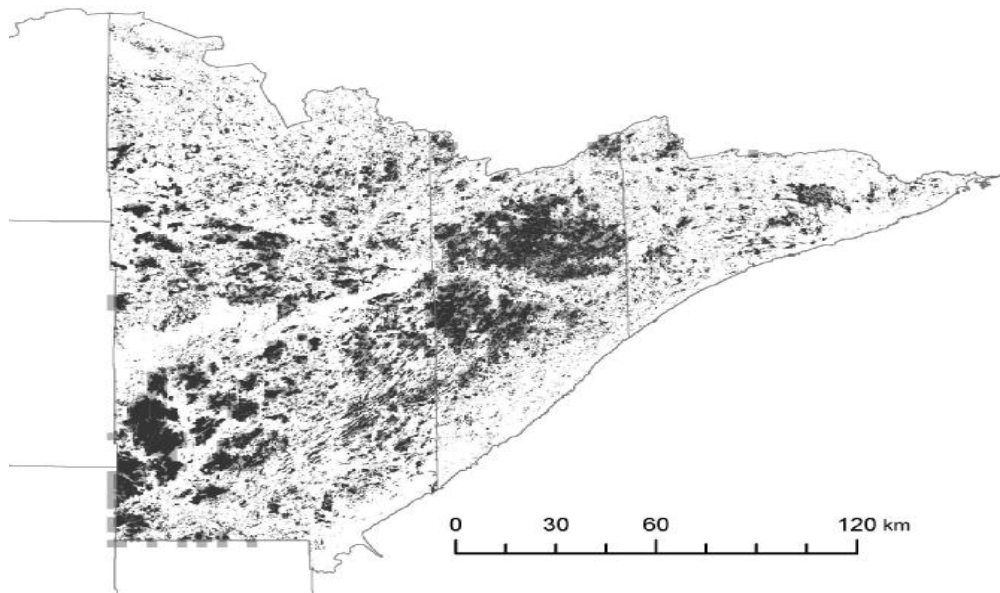
Moen et al. (2008) using the denning habitat data, developed a model to predict the spatial distribution of suitable denning habitat at the LAU scale. The northeastern Minnesota area modeled (Figure 5) includes the lynx critical habitat on the Superior National Forest.

This model has estimated that about 25% of the landscape in northeastern Minnesota consists of suitable lynx denning habitat. This information indicates that lynx denning habitat is abundant

and well-distributed in northeastern Minnesota and on the Superior National Forest. This information is useful both at the project and Forest-planning levels.

Research also supports the hypothesis that lynx can persist without immigration based on the reproductive rates of the female lynx studied, their movement rates, and the distribution of potential denning habitat in northeastern Minnesota (Moen et al. 2008).

Figure 5 – Distribution of predicted suitable denning habitat – Moen et al. 2004



While Moen et al (2008) provides another perspective on potential lynx habitat, the Superior National Forest denning habitat criteria is more conservative and therefore errors on the side of the species.

There has been no need for change in the existing key management direction from the Forest Plan, and the following lynx-specific management direction that is described in the 2004 BA in Section 4.5.4.3 on page 108, and in Section 3.6.2.1 of this BA.

O-WL-10: In LAUs in NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx.

G-WL-2: Provide for the protection of known active den sites during denning season.

G-WL-4: Within an LAU, maintain or promote well-distributed denning habitat in patches generally larger than five acres, comprising at least 10% of lynx habitat. Where less than 10% of forested lynx habitat within an LAU provides denning habitat, defer those management actions on NFS land that would delay achievement of denning habitat structure. *Only LAUs 44 and 46 are exempted from this guideline.*

G-WL-5: Following a disturbance on NFS land greater than 20 contiguous acres (such as blow-down, fire, insect, or disease) that could contribute to lynx denning habitat, generally

retain a minimum of 10% of the affected area on NFS land unless salvage or prescribed fire is necessary to address human health and safety (such as in the Wildland Urban Interface) or scenic integrity. *Only LAUs 44 and 46 are exempted from this guideline.*

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx critical habitat is discussed in Section 3.5.7.

3.5.5.3 - Productivity and Movement: Connectivity Habitat and Linkage Areas

There is no change in the management direction discussed and listed in the 2004 BA (Section 4.5.4.3). The indicator selected to address connectivity, Indicator 4 -Determining the percentage of total forested lynx habitat that provides adequate cover, has not changed.

New information for northeastern Minnesota is available based on research since 2004 that provides new information on lynx movements and the relationship to connectivity. Recent research conducted by the Natural Resources Research Institute (NRRI) indicates that lynx have varied home ranges, and disperse from them within the Superior National Forest, and to and from Canada (Burdett 2007, and Moen et al. 2010)

Movements were made across roaded areas, and also across the Boundary Waters Canoe Area Wilderness (BWCAW) which has few or no linear features such as roads, trails, and logging roads that could guide movement by lynx. When lynx made long distance movements, they often crossed several Lynx Analysis Unit (LAU) boundaries without changes in direction (Moen et al. 2010).

This study indicates that habitat connectivity does not appear to be a limiting factor in northeastern Minnesota. The combination of low topographic relief, the linear nature of movement paths, and the relative lack of differences in cover conditions indicate that geographically or topographically definable movement corridors do not exist for lynx either within in northeastern Minnesota, or between Minnesota and Ontario (Moen et al. 2010). Since northeastern Minnesota is the southern limit of boreal forest no connectivity or linkage areas could be managed for lynx movement to the south and west because of unsuitable habitat in those directions.

Dense forests occur in northeastern Minnesota, and while forest management activities alter patterns of vegetation community composition and structure at landscape and smaller scales. Both Frelich 2010 and Ravenscroft et al. 2010 consider northeastern Minnesota forest landscape as largely un-fragmented. In addition, Galatowitsch et al. 2009 indicates that the Boundary Waters Canoe Wilderness Area and the North-Shore portion of the SNF are high quality and variable (respectively) protection areas based on Minnesota County Biological Survey results.

Therefore, large portions of north-eastern Minnesota provide excellent connectivity habitat. There is no indication that lynx use defined linkage areas, and that they appear to move freely across the landscape throughout the Superior NF, and north into Canada. Connectivity within designated critical habitat appears to be excellent. Existing Forest Plan management direction is adequate to maintain linkage habitat.

3.5.6 - Analysis Indicators to address Productivity, Mortality, and Movement Risk Factors: Human Disturbance

The indicators identified in the 2004 BA (Section 4.5.5 p.111) for human disturbance remain valid. These indicators are used to analyze impacts from those risk factors primarily associated with human disturbances, including productivity, mortality, and movements. On NFS lands land management activities and programs that most frequently result in human disturbances include road and trail building for management purposes, recreation management, and occasionally, human development such as mines. These disturbances and human access to lynx habitat may result in increased potential for accidental or intentional trapping or shooting, disturbance at den sites, inter-specific competition with bobcats and/or coyotes for food; increased potential for predation from other carnivores, and lynx-vehicle collisions. These risk factors are discussed in more detail below. Ruediger et al. (LCAS 2000 p.2-16) provides more detailed descriptions of management activities and influences.

Risks

3.5.6.1 - Productivity and Mortality: Trails or Roads

Roads and trails may present several risks to lynx based on the potential for increased human use in lynx habitat (2004 BA Section 4.5.5.1). New information for lynx in northeastern Minnesota, with respect to roads and trails, is discussed below.

Squires et al (2010) found no evidence that lynx are sensitive to forest roads, including roads used by snow machines in the winter. This study concluded that seasonal resource-selection patterns of lynx were little affected by forest roads with low vehicular or snow machine traffic. In densely forested areas vehicle use was concentrated on roads and trails and lynx were disturbed less than other more open areas.

Moen et al. 2010 has shown that in Minnesota lynx on long-distance movements traveled within an average distance less than 200 m (656 ft) to a road when in roaded areas, and also < 200 m (656 ft) for random locations within home ranges. Lynx use of roads and other linear features is probably based on the energetic efficiency of moving along a road compared to moving through a forest. The northeastern Minnesota landscape is characterized by thick dense forests, boggy openings and lakes of various sizes. Lynx may find that it is more energetically efficient to walk on or alongside of a road, whether within the home range or while on a long-distance movement.

Snowshoe hare densities may be higher along roads and trails due to the juxtaposition of land cover types and ages along these linear routes. The forest edges along forest roads provide preferred habitat for snowshoe hare (Moen et al., 2008). Regenerating and young forest is the cover type that has the highest density of snowshoe hares in Minnesota (Moen et al., 2008). Therefore, road and trails appear to provide productive snowshoe hare edge habitat that lynx opportunistically utilize (Moen et al., 2008).

It is also possible that the existing road and trail network would make it easier for immigrating Canada lynx to find parts of the Superior National Forest with adequate snowshoe hare densities.

Moen et al. (2010) indicated that the road and trail network may increase the connectivity of different parts of the Superior National Forest, and may enable lynx to move further than they would in the absence of a road and trail network.

While linear features such as roads may benefit lynx from an energetic perspective, they may also be negative if they increase the chance of incidental mortality because of exposure to humans. It is unlikely that lynx behavior could be modified to prevent lynx from using linear features such as roads and trails (Moen et al. 2010). Managing the road and trail network can minimize the potential for conflicts. But whether roads and trails are closed to motorized vehicle use or not, it may be impossible to totally eliminate human-lynx conflicts since human use would continue on non-motorized routes. The benefit of reducing mortality risk by managing road networks and densities has to be balanced against the cost of not being able to use linear features on long-distance movements.

3.5.6.2 - Productivity and Mortality: Winter Dispersed Recreation

The 2004 BA (Section 4.5.5.2) documents the potential direct or indirect impacts of winter dispersed recreation to lynx.

As the 2004 BA (Section 4.5.5.2) states dispersed recreation activities seldom result in a direct loss of habitat. However, the Forest road and trail network that is used by dispersed recreation has resulted in a loss of lynx habitat by displacing native vegetation on the landscape. Indirect effects could include that snow compaction could result in increased access by competitors, and increased access for bobcat thereby increasing the potential for hybridization.

Homyack et al. (2008) studied Canada lynx-bobcat hybrids from Minnesota, New Brunswick and Maine and concluded that dispersed recreation was a not causal factor in these cases of studied animals. In addition, the Superior NF 2010 lynx DNA database indicates that only 7.6% of the 112 known lynx unique genotypes are individual lynx-bobcat hybrids (USDA 2010).

There is no indication that winter-dispersed recreation is either causing increased access for competitors or increasing access for bobcat on the Superior NF. Forest plan direction (Chapter 2, pages 2-30 and 2-31) exists to minimize these potential indirect effects to lynx (USDA 2004a). This direction has not changed due to the designation of critical habitat.

The potential impacts of winter-dispersed recreation have been assessed in every vegetation management project since 2004. This includes road construction as well as winter-dispersed recreation routes on roads and trails. The projects developed since the February 25, 2009 have addressed critical habitat in project-level consultations with the USFWS. The USFWS has issued concurrences with the Forests' "not likely to adversely affect lynx critical habitat" determinations every project consulted on since critical habitat designation.

3.5.6.3 - Mortality: Trapping and Shooting

The 2004 BA (Section 4.5.5.3) reiterated findings from Ruediger et al. 2000 (p.2-16) that incidental or illegal mortality may occur from trapping and hunting/poaching activities. The 2004

BA assumed and reported that mortality from trapping and shooting could and had occurred on lands managed by the Forest Service. Lynx mortality could indirectly or cumulatively occur on National Forest lands based on incidental trapping for other species such as fox or fisher. This cause and effect relationship has not changed since 2004.

Lynx mortality has been monitored in northeastern Minnesota during the last 10 years and continues to be monitored. Since 2000 39 incidents of lynx mortality due to incidental trapping or illegal shooting had occurred. Since the Forest Plan and BA were written two lynx were known to be killed due to incidental trapping within the NFS proclamation boundary. During the same period four lynx were killed due to incidental trapping or shooting, none of which were within the NFS proclamation boundary. Three additional lynx were killed due to legal trapping in Canada (USFWS 2010). Five trapped lynx were released alive from traps during that same period in Minnesota (USFWS 2010).

3.5.6.4 - Mortality: Vehicle Collisions

Direct mortality from vehicular collisions may be detrimental to lynx populations in the lower 48 states (Ruediger et al. 2000, 2004 BA Section 4.5.5.4). In the 2004 BA, the Forest assumed that mortality between high and low standard roads could differ, with potential mortality likely being higher on high standard (high-speed paved roads federally, state or county managed highways) and lower on the lower standard (low-speed) non-paved roads that are typically managed by the Forest Service. There has been no change in this assumption. However, mortality on low standard roads could still have an indirect or cumulative impact resulting from increased human use of National Forests. This cause and effect relationship has not changed since 2004.

Lynx mortality has been monitored in northeastern Minnesota during the last 10 years and continues to be monitored. In the 2004 BA it was reported that three incidents of lynx mortality on roads had occurred since 2000. Two were off the National Forest on highways, and one on the Superior National Forest on the Gunflint Trail (OML 5). Since the Forest Plan and BA were written four additional lynx mortalities have occurred in Minnesota (USFWS 2010). Only one of these mortalities occurred within the Forest proclamation boundary on a USFS managed road. The other two mortalities occurred well off NFS lands on federally-administered highways (USFWS 2010). The mortalities on National Forest lands since 2004 are far below the annual two lynx per year level that the USFWS expected in the 2004 Biological Opinion Incidental Take Statement (USDI 2004).

Management direction applicable to 3.5.6.1 through 3.5.6.4 above:

There have been no changes in the management direction listed in the 2004 BA (Sections 3.5.5.1 through 3.5.5.4 on pages 113 through 116). Conservation measures (objectives, standards and guidelines) were developed for the revised Forest Plan to address the potential for negative impacts from human disturbances. Key management direction (conservation measures, including those adapted from the LCAS, Chapter 7) in the Forest Plan includes Recreation and Transportation direction that benefits lynx (Forest Plan, Chapter 2). This key management direction, including the following lynx-specific direction, has been effectively applied to every

land management project on the Forest since 2004. There have been no substantive amendments to the 2004 Forest Plan.

Threatened and Endangered Species and Canada Lynx

There have been no changes in the following SNF management direction. The 2004 BA describes them in detail on pages 113 to 115 (Sections 4.5.5.1 through 4.5.5.4), and in **Section 3.6.2.1** of this BA.

O-WL-7: Minimize the building or upgrading of roads in areas that are important for threatened and endangered species habitat and for habitat connectivity.

O-WL-11: Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs on NFS land.

O-WL-13: Maintain or improve the natural competitive advantage of Canada lynx in deep snow conditions. Snow compacting activities (such as snowmobiling, snowshoeing, skiing, dog sledding) are planned and accommodated in areas best suited to the activity while maintaining large, interconnected areas of habitat with little or no snow-compacting, recreational activities.

O-WL-14: Through coordination with other agencies, participate in cooperative efforts to reduce, to the extent possible, the potential for lynx mortality related to highways and other roads within the proclamation boundary of the National Forest.

S-WL-2: In LAUs on NFS land allow no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas.

G-WL-6: Where a designated trail for snow-compacting activities is desired within LAUs, the proposed route should be planned to protect or improve the integrity of lynx habitat and minimize snow compaction in lynx habitat. The trail should be designed to:

- Move recreational use away from more sensitive or better quality lynx habitat,
- Concentrate use within existing developed areas rather than developing new recreational areas in lynx habitat, and or
- Be located within the outer boundaries of a currently used road and trail system.

G-WL-7: For newly constructed snow-compacting trails, effectively close or restrict to public access those trails, OML 1, OML 2, temporary, and unclassified roads that intersect the new trails unless these trails or roads are being used for other management purposes.

G-WL-8: Within LAUs generally maintain road and snow-compacting trail densities below 2 miles per square mile to maintain the natural competitive advantage of Canada lynx in deep snow. Where the total road and regularly-used snow-compacting trail densities are greater

than 2 miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline “roads” include all ownerships of classified and unclassified roads and “regularly-used trails” are those that are used most years for most of the snow-season.

G-WL-9: Dirt and gravel roads that are under the jurisdiction of the National Forest and that traverse lynx habitat on NFS land (particularly those roads that could become highways) should generally not be paved or otherwise upgraded in a manner that is likely to lead to significant increases to lynx mortality or substantially impedes movement and dispersal.

If the dirt and gravel roads described above are upgraded or paved in order to meet human health and safety or other environmental concerns and essential management needs, conduct a thorough analysis on effects to lynx and its habitat to determine minimum road design standards practical (including measures to minimize traffic speeds), to minimize or avoid foreseeably contributing to increases in human activity or adverse impacts to lynx and its habitat.

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx critical habitat is discussed in **Section 3.5.7**.

Recreation

There has been no need for change for the following SNF management direction. The 2004 BA describes them in Sections 4.5.5.1 through 4.5.5.4 on pages 115 and 116, and in **Section 3.6.2.1** of this BA.

O-RMV-1: A maximum of 90 additional ATV trail miles and 130 snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system.

S-RMV-1: Motorized recreation use of designated trails is prohibited unless the trail is designated open for specific motorized uses such as for ATVs, OHMs, and snowmobiles.

S-RMV-3: Cross-country OHV travel is prohibited. Standards and guidelines for cross-country snowmobile use are described in Chapter 3 because direction for that use varies by Management Areas. *Summary from Chapter 3:* For most Management Areas: Cross-country snowmobile use is generally allowed unless prohibitions or restrictions are needed for resource protection to meet management objectives. *For Unique Biological, Research Natural, and Wilderness:* Cross-country snowmobile travel is prohibited.

G-RMV-4: RMV use will generally be allowed on existing unclassified, OML1 and OML 2 roads (Except ORVs will generally be prohibited on OML 1 roads). Roads that are determined through site-specific analysis to have immitigable resource and social concerns and/or do not meet management objectives would be effectively closed. (See exceptions for Management Areas: wild segments of eligible Wild, Scenic, and Recreational Rivers, semi-primitive non-

motorizes recreation, Research Natural Areas, candidate Research Natural Areas, and Unique Biological Areas).

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx habitat is discussed in Section 3.5.7.

Transportation System

There has been no change for the following SNF management direction. The 2004 BA describes them in Section 4.5.5.4 on page 116, and in **Section 3.6.2.1** of this BA.

O-TS-2: Few new OML 3, 4 and 5 roads will be constructed.

O-TS-3: New roads built to access use land for resource management will be primarily OML 1 or temporary. *(Except for road straightening, or possibly short access roads to boat launches and similar projects, no new OML 3, 4 and 5 roads would be built during the next couple of decades)*

S-TS-3: As soon as access use is completed, stabilize temporary roads and effectively close them to motorized traffic. Vegetation will be established within 10 years after the termination of the contract, lease, or permit.

S-TS-4: Decommission unclassified roads that are not needed in the Forest road and trail system and special use permitted roads that are no longer needed. Decommissioning will make the road unusable by motorized vehicles and stabilize the roadbed.

G-TS-12: On existing OML 1 roads, an effective barrier will generally be installed as needed to prevent use by highway-licensed vehicles and ORVs, ATV and OHM use may continue to be allowed on some existing OML 1 roads.

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx habitat is discussed in Section 3.5.7.

Indicators for Human Disturbance factors:

There have been no changes in the human disturbance factors listed in the 2004 BA in Section 4.5.5, pgs 116 and 117. The use of these indicators to analyze effects to lynx productivity, mortality, and movements based on human disturbance has not changed. The rationale behind these indicators has not changed because they continue to provide reasonable Forest-wide measures indicative of effects at the programmatic scale.

Indicators 5-9 were developed to address several types of motorized human access on Forest such as; recreation trails, low-standard and temporary roads developed for management operations and cross-country. As indicated in the 2004 BA cross-country use in the winter is still considered to have the same effects as summer-time recreation trails, low-standard and temporary road use, as well as snow compaction on winter routes that include frozen lakes and rivers routes. Indicators 5-9 are:

Indicator 5 – Miles of ATV trails allowed

Indicator 6 – Miles of snowmobile trails allowed

Indicator 7 – Miles of temporary road and Objective Maintenance Level (OML) 1 and 2 (low standard) system road planned.

Indicator 8 – Policy on cross-country use of ATVs and snowmobiles.

Indicator 9 – Policy on use of ATVs and snowmobiles on OML 1 and 2 roads.

There is no change in the use of these indicators in project-level planning and in the implementation, monitoring and evaluation of the Forest Plan, and the application of other management direction listed in the 2004 BA (Sections 3.5.5.1 - 3.5.5.4) to project-level planning, since 2004. The Forest continues to use the LCAS procedural guidance to address mortality risk factors (Appendix E, USDA 2004a).

3.5.7 - Other Risk Factors not addressed in detail: Productivity Movements and Other Large-Scale Factors, and Productivity

This section reviews **Section 4.5.6** in the 2004 BA which describes additional risk factors that were not analyzed in detail because they are not applicable, are not under Forest Service control, or are considered minor on the Superior NF.

3.5.7.1 - Movement and Productivity

A. Highways, Railroads, Utility Corridors, Ski Areas and Other Large Resorts

There is no change in the description and discussion of how the Forest Plan would address these major developments as discussed in the 2004 BA (Section 4.5.6.1.A) on page 117. As discussed in the 2004 BA these types of projects are generally unpredictable, and this BA cannot analyze unknown factors. Management direction would continue to fully consider lynx and lynx habitat if any of these types of projects are proposed.

Key management direction in the Forest Plan (Chapter 2) that is applicable to these types of projects includes some Recreation and Transportation System direction and the following specific direction as indicated in the 2004 BA, and in **Section 3.6.2.1** of this BA.

O-WL-4: Maintain, protect, or improve habitat for all threatened and endangered species by emphasizing and working towards the objectives of federal recovery plans and management direction in Forest Plans.

O-WL-5: Seek opportunities to benefit threatened and endangered species from the spectrum of management activities on NFS land.

O-WL-6: Reduce or eliminate adverse effects on threatened and endangered species from the spectrum of management activities on NFS land.

O-WL-7: Minimize the building or upgrading of roads in areas that are important for threatened and endangered species habitat and for habitat connectivity.

O-WL-8: Promote the conservation and recovery of Canada lynx and its habitat.

O-WL-11: Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs on NFS land.

O-WL-12: Through partnerships with other agencies and landowners, participate in cooperative efforts to identify, map, and maintain or restore, where feasible, linkage areas that provide habitat connectivity sufficient to allow lynx to disperse between disjunct blocks of lynx habitat at larger landscape scales (for example, among National Forests in the Great Lakes region).

G-WL-1: Within LAUs on NFS land, moderate the timing, intensity, and extent of management activities, if necessary, to maintain required habitat components in lynx habitat, to reduce human influences on mortality risk and inter-specific competition, and to be responsive to current social and ecological constraints relevant to lynx habitat.

G-WL-9: Dirt and gravel roads that are under the jurisdiction of the National Forest and that traverse lynx habitat on NFS land (particularly those roads that could become highways) should generally not be paved or otherwise upgraded in a manner that is likely to lead to significant increases to lynx mortality or substantially impedes movement and dispersal.

D-REC-3: The Forest provides developed sites, facilities, trails, water access sites, and other recreation opportunities within health and safety, resource protection, cost, and maintenance requirements.

G-REC-4: Development of new campgrounds will generally not be considered.

D-TS-2: The National Forest road system is the minimum needed to provide adequate access to both NFS and non-NFS land.

D-TS-3: The transportation system design considers environmental, social, and health concerns.

How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx critical habitat is discussed in Section 3.5.7.

B. Land Ownership Patterns

The discussion on the importance of land ownership patterns for lynx management in the 2004 BA remains valid. In the Great Lakes area, the ability to provide connectivity between the two northern Minnesota National Forests is complicated by the lack of contiguous National Forest ownership and varied land use patterns. However, the eastern two thirds of the Superior NF is largely consists of federal ownership, and the Boundary Waters Canoe Area Wilderness (BWCAW) Refugium remains intact and contiguous with Canada.

Ownership adjustments have occurred on the Superior NF since 2004. The largest land exchange, the South Kawishiwi Cabin Group, occurred in 2010. In that land exchange approximately 1,213 acres were acquired by the Forest and approximately 425 acres were disposed of resulting in a net acquisition of 788 acres. Since 2004 all other individual land purchases, donations, and exchanges were less than 100 acres. The Superior NF acquired an estimated average of 40 acres a year, resulting in a potential 240 acres acquired since 2004 (USDA 2010c). The land ownership changes contribute towards Forest-wide lynx habitat but the amounts that have occurred since 2004 have been relatively insignificant compared to the large area of the Superior National Forest (2,125,931 acres).

Management direction in the Forest Plan that is applicable to land ownership changes has not changed since the 2004 BA. The 2004 BA describes them in detail (Section 4.5.6.1, pages 118 to 119), and in **Section 3.6.2.1** of this BA.

D-LA-1: The amount and spatial arrangement of National Forest System land within the proclamation boundary of the Forest are sufficient to protect resource values and interests, improve management effectiveness, eliminate conflicts, and reduce the costs of administering landlines and managing resources.

O-LA-1: Through various land adjustment procedures (e.g., purchase, donation, and exchange) and a landownership adjustment map, secure a land ownership pattern that supports and enhances total Forest Plan resource management objectives

G-LA-2: The Land Adjustment Zone map and descriptions of zones will be referenced by the Forest Plan. The map will be updated on an as needed basis.

As discussed in the 2004 BA land ownership changes are generally unpredictable. The Forest Service does not control private development, but may have some impact from land adjustment programs. The Forest Plan does not propose specific land ownership adjustments, but it does provide guidance for land adjustments programs that emphasize maintenance or acquisition of lynx habitat. Management direction would continue to fully consider lynx and lynx habitat if any of these types of projects are proposed. The emphasis to benefit lynx in land adjustments to meet direction in G-WL-3 remains. How this lynx-specific management direction addresses the relevant Primary Constituent Elements (PCEs) of lynx critical habitat is discussed in **Section 3.5.8**.

C. Livestock Grazing

There is no change to the points made regarding livestock grazing made in the 2004 BA (Section 4.5.6.1). There currently are no grazing permits on the Superior NF. The general direction in the Forest Plan (O-SU-2) ensures that lynx and lynx habitat would be fully considered if a special-use permit for grazing is requested. If this special-use is proposed, projects would undergo appropriate environmental planning, analysis and coordination with the USFWS. The Forest Plans' management direction would ensure that lynx and its habitat are fully considered. For these reasons, effects from livestock grazing cannot be anticipated and this Biological Assessment does not provide additional analysis.

D. Other Human Developments: Oil and Gas Leasing, Mines, and Agriculture

There is no change to the points made regarding oil and gas leasing, mines and agriculture made in the 2004 BA (**Section 4.5.6.1**). Oil and gas leasing, or conversion to agricultural uses are not historical land uses on the SNF, but mining prospecting and extraction occur. There are no agricultural uses on the Superior NF nor are any expected due to the lack of historical use.

Mining activities continue to occur within the proclamation boundary of the Superior NF. Due to mineral deposits this is expected to continue for the foreseeable future. The Forest does not own the mineral rights over a significant portion of the SNF. As with vegetation management projects, mining activities would undergo appropriate environmental planning and analysis, and coordination with the USFWS and others.

For any of these activities the direction in the Forest Plan (USDA 2004, Chapter 2) will ensure that lynx and lynx critical habitat would be fully considered as these activities are requested and addressed at the project-level. LAU limits will be considered as needed (15%, 30%, road density and snow compacting thresholds or limits). Thus, although new mining activities may be proposed, lynx habitat, etc will be protected to the extent that the SNF has control over mining proposals.

3.5.7.1 - Other Large-Scale Factors

A. Fragmentation and Degradation of Refugia

There are no changes in the points made in the 2004 BA (section 4.5.6.2(A)) with the exception that the Chippewa NF is not being analyzed in this BA. The Boundary Waters Canoe Area Wilderness (BWCAW) Refugium remains intact and contiguous with Canada.

B. Habitat Degradation by Non-Native Invasive Plant Species

There are no changes in the points made in the 2004 BA (section 4.5.6.2(B)). Non-native plant species remain a threat to native vegetation across the Superior NF.

3.5.8 - Lynx Analysis Indicators Crosswalk to Primary Constituent Elements (PCEs) of Critical Habitat

Forest Plan Direction and Lynx Analysis Indicators

In 2005, the SNF and USFWS developed a streamlined consultation method for conducting project level consultations that implement the Forest Plan. The method tiers project analysis to the forest level programmatic BA, where appropriate. Through this process we developed standardized lynx analysis indicators. These analysis indicators also serve as appropriate indicators for analysis of effects to critical habitat and its constituent elements. This is because the indicators address relevant Primary Constituent Elements (PCEs) of lynx critical habitat - those physical and biological features that are essential to the conservation of the species.

Table Lynx-4 compares the Primary Constituent Elements (PCEs) of Lynx Critical Habitat to Forest Plan BA lynx analysis indicators in the 2004 Forest Plan BA. **Critical habitat** for lynx is defined as boreal forest landscapes supporting a mosaic of differing successional forest stages and conditions. Through consultations with the USFWS the SNF has identified a new Indicator - **Connectivity**. Connectivity is defined as the presence of suitable habitat and other conditions that allow for the unimpeded movement of lynx across the landscape. The following four elements are considered Primary Constituent Elements (PCE) of Critical Habitat:

- a. Presence of snowshoe hares and their preferred habitat conditions, including dense understories of young trees or shrubs tall enough to protrude above the snow;
- b. Winter snow conditions that are generally deep and fluffy for extended periods of time;
- c. Sites for denning having abundant coarse, woody debris, such as downed trees and root wads;
- d. Matrix habitat (*e.g.*, hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range. The important aspect of matrix habitat for lynx is that these habitats retain the ability to allow unimpeded movement of lynx through them as lynx travel between patches of boreal forest.

The Forest has been considering and consulting on the effects to lynx critical habitat using this method since critical habitat was proposed in 2005 (USDI FWS 2005). Analyses of effects to lynx are primarily based on examining effects to lynx habitat. Therefore, much of the same analysis and considerations, are applicable with regards to critical habitat. However, since critical habitat was designated after the 2004 programmatic Forest Plan consultation, and because there is new information to be considered since 2004, re-initiation of consultation is warranted. Furthermore, the addition of critical habitat and connectivity as formal Forest Plan Indicators are warranted. Table Lynx-4 shows the crosswalk between Lynx Analysis Indicators and Critical Habitat PCEs.

Table Lynx-4. Lynx Analysis Indicators and their Crosswalk to Primary Constituent Elements (PCE) of Critical Habitat	
Forest Plan Lynx Analysis Indicators	PCE
1a. Snowshoe hare habitat acres	a
1b. Percent of unsuitable habitat on NFS land	a, b, c, d
2. Acres of red squirrel habitat	d
3. Denning habitat in patches > 5 acres	c
4. Percent of lynx habitat in LAUs with adequate canopy cover- upland forest > 4 years old and lowland forest > 9 years old	a, c, d
5. Miles of ATV trails allowed	b
6. Miles of snowmobile trails allowed	b
7. Miles of temp and OML 1&2 roads	b
8. Policy on cross-country use of ATVs and snowmobiles	b
9. Policy on use of ATVs and snowmobiles on OML 1 and 2 roads	b
10. Acres of snowshoe hare habitat in which within stand structure will be increased thru diversity and under-planting of conifer on SNF lands.	a

11. Acres and % of lynx habitat currently unsuitable on all ownerships	a, c, d
12. Cumulative change to unsuitable condition on NFS lands. (S-WL-1)	a, c, d
13. Road and compacted trail density on all ownership.	b
14. Connectivity (2010 addition)	b, d

Table Lynx-5 shows the crosswalk between Critical Habitat PCEs and Forest Plan Direction.

Table Lynx-5. Forest Plan Management direction that addresses the Primary Constituent Elements (PCE) of Critical Habitat		
Critical Habitat PCE	Forest Plan direction that addresses the element	Is direction adequate to address PCE?
(a) Presence of snowshoe hares and their preferred habitat conditions, including dense understories of young trees or shrubs tall enough to protrude above the snow	D-VG-3 D-WL-3c and h D-LA-1 O-VG-1, 11 and 13 O-WL-4-6, 8-10, 11-13, 15 O-LA-1 G-WL-3 G-LA-2 S-WL-1 S-TS-3, 4 Vegetation LE and MIH objectives Appendix E sec 4 and 7	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE.
(b) Winter snow conditions that are generally deep and fluffy for extended periods of time;	D-WL-3c, h and 5 D-REC-3 D-RMV-1 O-WL-4-6, 13 and 15 O-RMV-1 S-WL-2 S-RMV-3 S-TS-3, 4 G-WL-2, 6-8 Appendix E sec 4 and 7	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE.
(c) Sites for denning having abundant coarse, woody debris, such as downed trees and root wads; and	D-VG-3 D-WL-3c and h D-REC-3 D-LA-1 O-VG-1, 11 and 13 O-WL-4-6, and 10 O-LA-1 S-WL-1 S-TS-3, 4 G-WL-1, 4 and 5 G-LA-2 Vegetation LE and MIH	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE.

Table Lynx-5. Forest Plan Management direction that addresses the Primary Constituent Elements (PCE) of Critical Habitat		
Critical Habitat PCE	Forest Plan direction that addresses the element	Is direction adequate to address PCE?
	objectives Appendix E sec 4 and 7	
(d) Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range. The important aspect of matrix habitat for lynx is that these habitats retain the ability to allow unimpeded movement of lynx through them as lynx travel between patches of boreal forest.	D-WL-3a, h D-VG-3 D-LA-1 O-WL-4-8, 11-15 O-TS-2, 3 O-LA-1 S-WL-1 S-TS-3 and 4 G-WL-1 G-WL-3 G-TS-12 G-LA-2 Appendix E sec 5, 6 The BWCAW Refugia provides for connectivity to Canada, Voyageur's National Park and other areas in northern Minnesota: O-WL-15	YES – All these Forest Plan direction provide conditions to support and sustain this Critical Habitat PCE.

Table 5 lists specific Forest Plan direction that addresses each PCE, which were identified through discussions between the Superior National Forest and USFWS. This direction is described in detail in Section 3.6.2.1 of this BA.

How Forest Plan Direction Addresses the Critical Habitat PCEs:

The Forest Plan direction and lynx habitat modeling criteria was finalized in 2004, five years prior to the final designation of lynx critical habitat. However, the Forest Plan anticipated the designation of critical habitat and provides direction that inherently maintains critical habitat for lynx conservation and recovery. Much of this direction applies to one or more of the PCEs in Tables Lynx-4 and Lynx-5. This indicates the flexibility of the Forest Plan guidance for lynx and prey species habitat management. The following narratives summarize how Forest Plan direction addresses each PCE and why the Forest Plan direction is adequate in addressing each PCE.

1. PCE (a): This PCE focuses on maintaining snowshoe hares and their preferred habitat as the primary prey species for lynx. The direction listed in Table 5 provides vegetative composition, age classes and structure in amounts, distribution and patterns that supports long-term desired future conditions (D-VG-3, D-WL-3c and h). This support for long-term sustainable snowshoe hare habitat is accomplished through a combination of wildlife-specific, other-resource management, vegetation landscape ecosystem and Management Indicator Habitat (MIH) direction.

The Forest Plan lynx habitat management direction (USDA 2004, O-WL-11, O-WL-12 and O-WL13, p.2-29) also provides connectivity that allows lynx and prey (snowshoe hare) to disperse within the Forest, in both actively-managed and BWCAW-portions, and into Canada through the BWCAW. Naturally-disturbed forest conditions are provided in patch sizes and across the landscape to support dense understories of young forest for snowshoe hare habitat.

The Forest plan supports snowshoe hare habitat through secure land ownership patterns that enhance vegetation management objectives. Between 2005 and 2010, land exchanges acquired 1,212.8 acres and disposed of 424.6 acres for a total of 788 acres net gain of federal ownership (USDA 2010c). All other individual purchases, donations, and exchanges were less than the 100-acre. On average year, the Forest may acquire an estimated 40 acres of land per year. These land ownership changes benefit lynx and snowshoe hares through Forest Plan direction D-LA-1, O-LA-1 and G-LA-2 (USDA 2004, p.2-50).

Wildlife-specific direction promotes the conservation and recovery of lynx through prey species habitat management by allowing for both natural and active management to retain or improve prey habitat in LAUs, the BWCA and non-LAU areas. There would be no further reduction in suitable conditions through management and disturbances within LAUs if more than 30 percent of an LAU, in all ownerships, is in an unsuitable condition (USDA 2004, G-WL-3, p. 2-30). National Forest management activities shall not change more than 15 percent of lynx habitat in LAUs to an unsuitable condition within a 10-year period (USDA 2004, S-WL-1, p.2-30).

This combined direction will support and maintain prey species habitat features, thereby conserving critical habitat for Canada lynx.

2. PCE (b): This PCE focuses on minimizing the ability of competitors to access habitat areas that lynx occupy during the winter. The direction listed in Table Lynx – 5 minimizes the

impacts of snow-compacting motorized and non-motorized recreational activities across the Forest landscape outside the BWCAW. A combination of wildlife-specific, other-resource management direction provide direction to plan and implement snow-compacting activities while maintaining habitat integrity and connectivity, and large areas of the Forest with little or no snow-compacting recreational activities. Forest and smaller-scale projects use this direction to maintain secure critical habitat for lynx by managing the Forest road and trail network.

For example, the Forest-wide Travel Management Project (USDA 2009), which implements the 2005 National Travel Management Rule (36 CFR 212, 251, 261 and 295), assessed, determined and mitigated the effects of motorized recreational activities. The Travel Management Project designates existing roads to provide recreational opportunities and for resource management and access purposes, but reduces potential adverse effects to lynx by closing other unclassified roads not needed for human use. The decision was to add 142 miles of existing unclassified roads to the Forest Service system while decommissioning 154 miles of unclassified roads. This action reduced the overall amount of motorized road density in lynx habitat and is consistent with Forest Plan direction G-WL-8 (USDA 2004a, p.2-30) which is used to assess and manage road and snow-compacting road density (USDA 2011f, and USDA 2008).

While Forest Plan direction S-WL-2 (USDA 2004a, p.2-30) can apply to other Forest Service projects it is not applicable to the TMP project (USDA 2008) since the TMP does not create or decommission groomed or designated over-the-snow trail routes. S-WL-2 specifies that there would be no net increase in designated-over-the-snow routes unless use is consolidated and improves habitat through a net reduction of compacted snow areas. The Forest has not constructed any new ATV and snowmobile trails since 2004 (although the TMP would construct 2.5 miles of new ATV trail when the project may be implemented). Since the TMP is not constructing groomed or designated trail routes S-WL-2 does not apply (USDA 2011f). The TMP action was also consistent with other wildlife-specific direction that applies to PCE (9b).

Other Forest Plan direction also closes or decommissions trails, and/or unclassified, Special Use Permit (SUP) and temporary roads as soon as access use is completed, or when these trails or roads are no longer needed (USDA 2004, S-WL-2, G-WL-6, 7 and 8, p. 2-30). Since 2004, there are actually 82.9 miles (based on revised calculations - see Table Lynx 16) vs. the 2004 baseline estimate of 90 miles of purpose-built ATV trails, and there has been no change in the 130 miles of purpose-built snowmobile trail on the Forest (USDA 2010e). Furthermore, the 154 miles of unclassified road will be decommissioned once the implementation of the Travel Management Project occurs. This direction (**S-WL-2**, **S-TS-3** and **S-TS-4**) conserves critical habitat by protecting lynx habitat from use by lynx competitors (USDA 2004a, p.2-30, and 2-50).

This combined direction will support and maintain lynx habitat that is secure from competitors, thereby conserving critical habitat for Canada lynx recovery.

3. PCE (c): This PCE focuses on providing abundant coarse woody debris, such as downed trees and root wads for lynx denning. The direction listed in Table Lynx – 5 provides vegetative composition, age classes and structure in amounts, distribution and patterns that supports the current and long-term recruitment of down wood that provides lynx denning habitat across the Forest landscape outside the BWCAW (D-VG-3, D-WL-3c and h). A combination of wildlife-specific, other-resource management direction provides direction to manage the distribution of predicted suitable denning habitat (Moen et al. 2008) depicted in Figure 3. This direction includes G-WL-4 and 5 (USDA 2004, p.2-30).

Forest Plan direction closes or decommissions trails, and/or unclassified, Special Use Permit (SUP) and temporary roads since these routes and associated use could affect coarse woody debris recruitment and maintenance due to fuel wood cutting) (USDA 2004, S-WL-2, G-WL-6, 7 and 8, p. 2-30). Since 2004, there are actually 82.9 miles (based on revised calculations - see Table Lynx 16) vs. the 2004 baseline estimate of 90 miles of purpose-built ATV trails, and there has been no change in the 130 miles of purpose-built snowmobile trail on the Forest (USDA 2010e). The 154 miles of unclassified road that will be decommissioned will further reduce adverse effects once the Travel Management Project implementation occurs Forest Plan direction O-TS-2 and 3, O-WL-7, S-TS-3 and S-TS-4 conserves critical habitat by protecting denning sites or habitat through constructing fewer OML 3,4 and 5 roads, by using more temporary and OML 1 roads; decommissioning unclassified roads, and closing or restricting access from existing/newly constructed trails to intersecting OML 1, 2, temporary and unclassified roads unless needed for management (USDA 2004a, p.2-49 and 2-50).

This combined direction will support and maintaining availability and distribution of suitable denning habitat, thereby conserving critical habitat for Canada lynx recovery.

4. PCE (d): This PCE focuses on providing for lynx travel between patches of preferred boreal forest through matrix habitats. The direction listed in Table Lynx – 5 provides vegetative composition, age classes and structure in amounts, distribution and patterns that supports hardwood forest and dry forest, as well as non-habitat or other habitat types that do not support snowshoe hares but may provide cover or linkages.

The Forest Plan provides for these matrix habitats is a combination of wildlife-specific, other-resource management, vegetation landscape ecosystem and Management Indicator Habitat (MIH) direction (USDA 2004, D-VG-3, D-WL-3c and h, pgs 2-22, -27 and -28).

Habitat management direction also provides connectivity that allows lynx and prey (snowshoe hare) to disperse within the Forest, in both actively managed and BWCAW portions, and into Canada through the BWCAW (USDA 2004, O-WL-11, p. 2-29). No management activities have occurred that are preventing the lynx from moving freely across the Forest and through the BWCAW (Moen et al. 2010).

The Forest Plan supports matrix habitat through secure land ownership patterns that enhance vegetation management objectives. Between 2005 and 2010, land exchanges acquired 1,212.8 acres and disposed of 424.6 acres for a total of 788 acres net gain of federal ownership (USDA 2010c). This gain is a mix of matrix and suitable lynx habitat. These land ownership

changes benefit lynx and snowshoe hares through Forest Plan direction O-LA-1 and G-LA-2 (USDA 2004a, p.2-50).

This combined direction will support and maintain the ability for lynx to and from preferred habitats through other non-preferred habitats in the critical habitat area of northern Minnesota.

While the listed Forest Plan direction provides for critical habitat the key is the implementation of this direction at the project-level. Since the designation of critical habitat on February 28, 2009 the USFWS has not required changes in Forest Plan direction due to the designation of critical habitat. The application of the listed Forest Plan Direction is described in individual Forest project documents.

3.6 - Affected Environment and Environmental Consequences

Scope and Scales of Analysis

As in the 2004 BA, the Affected Environment and Environmental Consequences have been analyzed for lynx habitat on NFS lands at the Lynx Analysis Unit (LAU), and summarized in this Biological Assessment to the Planning Area (Forest-wide) scale.

Conditions are compared and contrasted between the 2004 BA data and 2010 data which are still within Decade 1 (2004-2014), as defined in the Forest Plan, are used in this lynx analysis. Data from is based on actual accomplishments and some remaining Decade 1 values (FY11-FY14) are based on averages of these accomplishments.

Decades 1 and 2 should be considered short-term and Decades 5 and 10 are considered long-term. Decades 2, 5, and 10 values used in the 2004 BA are still considered valid, but are not reassessed in this BA because the designation of critical habitat had no influence on how those values were developed. Decade 2 values could be reassessed at the mid-point of Forest Plan implementation if deemed necessary. However, some Decade 2, 5 and 10 data from the 2004 BA may be displayed for comparison purposes.

3.6.1 - Affected Environment

Programmatic Land Allocations

In the 2004 BA (**Section 4.5.1**) programmatic land allocations were reviewed as related to the National Lynx BA (Hickenbottom et al. 1999). “Non-developmental” and “Developmental” land allocations definitions and conditions were discussed in the 2004 BA (USDA 2004b, page 122). Since 2004 relatively minor changes have occurred in NFS land ownership amounts and overall percentages for the Superior NF that was disclosed in the 2004 BA. Because there have been no changes to programmatic land allocations in the Forest Plan there is essentially no change in the Forest-wide land ownership, Landscape Ecosystems and Management Areas from 2004 (USDA 2010f). However, at the individual LAU scale lynx habitat changes have occurred and are discussed following subsections as they relate to analysis indicators.

Developmental and non-developmental NFS lands still provide lynx habitat and connectivity across the Forest. The six eligible Wild, Scenic, and Recreational Areas - Pigeon River, Cloquet River, Brule River, St. Louis River, Temperance River and Vermilion River (USDA 2004, p. 3-17) continue to have non-intensive management, provide additional habitat and valuable connectivity.

Habitat on non-NFS lands within the proclamation boundary and surrounding the Superior NF remains primarily forested and continues to provide a degree of habitat connectivity with the Chippewa NF. The primarily forested landscape in northern Minnesota will continue to dominate the landscape for the foreseeable future.

LAUs and Superior NF BWCAW Refugium

Between 2005 and 2010, land exchanges acquired 1,212.8 acres for the Forest and disposed of 424.6 acres for a total net gain of 788 acres of federal ownership. All other individual purchases, donations, and exchanges were less than 100-acre mark. During an average year, the Forest may acquire an estimated 40 acres of land (USDA 2010c). These land ownership changes are minor compared to the total acres anticipated to be exchanged under the 2004 Forest Plan. Therefore, there is essentially no change in gross acre amounts reported in the 2004 BA. Table Lynx-6 summarizes the data as of 2010 for the Superior NF. Data on individual LAUs is located in Appendix C.

Table Lynx-6: Summary of gross acres and percent in LAUs or Refugium in 1) all ownerships, 2) all water bodies, 3) NFS lands (lynx habitat and non-habitat), and non-NFS lands.								
Number of LAUs Or Refugium	1) Gross Acres (all land & water in all ownerships)		2) All water bodies (GIS water layer)		3) NFS land (excludes water)		4) Non-NFS land (excludes water)	
	Acres (1000s)	% of gross acres on NF	Acres (1000s)	% of total LAU or Refugium (gross ac.)	Acres (1000s)	% of total LAU or Refugium (gross ac.)	Acres (1000s)	% of total LAU or Refugium (gross ac.)
47 LAUs	2,017	54	121	6	1,288	61	608	30
BWCAW Refugium	1,096	29	198	18	755	69	144	13
Total in LAUs and Refugium	3,113	83	319	8	2005	72	790	28
Reference: USDA 2010b and USDA 2011e (2010 data)								

In the 2004 BA, the Forest developed a model to identify lynx and non-lynx habitat. That model has not changed since 2004. Table Lynx-7 summarizes the proportion of NFS land within LAUs that is lynx habitat and non-habitat data as of 2010 for the Superior NF. Information for the BWCAW is in Section 3.6.2.

Table Lynx-7: Acres and percent of 1) total NFS lands in LAUs, 2) lynx habitat in LAUs on NFS lands, and 3) non-habitat in LAUs on NFS lands. (Excludes all water-bodies and non-NFS lands).					
Number of LAUs	1) Total NFS Land	2) Lynx habitat		3) Lynx Non-habitat (not including water >10 acres in size)	
	Acres	Acres	% of total NFS lands	Acres	% of total NFS lands
47	2,017, 971	1,268,628	63%	10,120	.05%
Reference: USDA 2010b and USDA 2011e (2010 data)					

Other Critical Lynx Habitat outside of LAUs

The five non-LAU areas outside of the defined LAUs provide varied amounts of lynx habitat, but is not managed using the LAU approach, and LAU management direction previously discussed, does not apply to these non-LAU areas. Table Lynx-8 displays the current 2010 conditions of these other critical habitat areas.

Table Lynx-8: Lynx habitat types: lynx habitat conditions on NFS lands in non-LAU critical habitat areas		
Habitat Indicators	Acres	% of NFS lands in lynx habitat
Total NFS lands in NLAs	73,976	-
Total lynx habitat on NFS lands in NLAs	73,783	99.7
Forested habitat	67,579	91.4
Hare habitat	47,102	63.7
Unsuitable habitat	369	0.5
Denning habitat	35,497	48.0
Denning habitat > 5 acres	35,377	47.8
Source: USDA 2011i (2010 data)		

The criteria used to identify lynx and non-lynx habitat are used for the five critical habitat units within the Superior National Forest. Tables Lynx-9 and 10 summarizes the quantity and proportion of NFS land within non-LAU areas, and the quantity of lynx habitat and non-habitat data as of 2010.

Table Lynx-9: Summary of gross acres and percent in NLAs or Refugium in 1) all ownerships, 2) all water bodies, 3) NFS lands (lynx habitat and non-habitat), and non-NFS lands.							
NLA	1) Gross Acres (all land & water in all ownerships)	2) All water bodies (GIS water layer)		3) Total NFS land (excludes water)		4) Non-NFS land (excludes water)	
	Acres	Acres	% of total gross ac.	Acres	% of total gross ac.	Acres	% of total gross ac.
1	85,399	1,582	1.8	7,761	9.1	76,107	89.1
2	63,247	155	0.2	32,670	51.7	30,421	48.1
3	66,083	583	0.9	7,575	11.5	57,925	87.7
4	41,761	958	2.3	13,253	31.7	27,549	66.0
5	253,765	29,474	11.6	12,716	5.0	211,574	83.4
Totals	510,254	32,702	6.4	73,976	14.5	403,576	79.0
Source: USDA 2011i (2010 data)							

Table Lynx-10: Acres and percent of 1) gross acres in NLAs, 2) total NFS lands in NLAs, 2) lynx habitat in NLAs on NFS lands, and 3) non-habitat in NLAs on NFS lands. (Excludes all water-bodies and non-NFS lands).						
NLA	1) Gross acres in all ownerships	2) Total NFS lands	3) Lynx habitat		4) Lynx Non-habitat (not including water >10 acres in size)	
	Acres	Acres	Acres	% of total on NFS lands	Acres	% of total on NFS lands
1	85,399	7,761	7,684	99.0	76	1.0
2	63,247	32,670	32,628	99.9	42	0.1
3	66,083	7,575	7,558	99.8	17	0.2
4	41,761	13,253	13,237	99.9	17	0.1
5	253,765	12,716	12,675	99.7	41	0.3
Source: USDA 2011i (2010 data)						

Table Lynx-9 indicates that in contrast to National Forest lands within LAUs, the amount of lynx habitat on NFS lands within non-LAU areas is a much lower percentage because the US Forest Service is a minority owner within four out of five non-LAU areas.

Lynx Habitat – Forest Conditions

The discussions of current lynx habitat conditions are only for LAUs outside the BWCAW. Information for conditions and resource management direction in the BWCAW is in Section 3.6.2. With one exception, there is no change in how the existing vegetative conditions for each LAU are analyzed since 2004. The conditions analyzed in the 2004 BA were: total current lynx habitat; non-habitat (not ecologically capable of supporting lynx or its prey either currently or in the future); prey habitat (snowshoe hare and red squirrel); currently unsuitable habitat (forest too young to support snowshoe hares); denning habitat, and connectivity habitat. These conditions (except for red squirrel) are summarized Forest-wide for all LAUs in this BA. Analysis data for individual LAUs is located in Appendix C. However, new research information is now available compared to 2004.

Forage Habitat (suitable for snowshoe hare and red squirrel)

There is no change in this section compared to the information discussed in the 2004 BA (Section 4.5.4.1, p.107 and Section 4.6.1 Affected Environment, p.124) with the exception that research has determined that red squirrel is not a key prey species as previously thought of (USDA 2004b BA See Lynx Ecology - Section 3.3.2 Diet, p. 5). Therefore, there will be no discussion of the red squirrel in this section.

LAU Conditions

Indicator1a: Snowshoe hare habitat

The current (2010) amount and percentage of snowshoe hare habitat in LAUs Forest-wide and only on NFS lands for the Superior NF is 789,963acres (61.6% of total lynx habitat). These levels of snowshoe hare habitat remains above the amount expected under the Range of Variability

(RNV). Project-level planning has maintained or enhanced snowshoe hare (young forest) habitat, and it is well distributed across the Forest based on projects implemented since 2004 (USDA 2010h, and 2010l - see pdf).

Indicator1b: Unsuitable habitat

Table Lynx-11 displays the current amount and percentage of unsuitable habitat in LAUs, in 2004 and 2010.

Table Lynx-11: 1) Acres of unsuitable habitat on NFS land, and percent of NFS lynx habitat in LAUs that is unsuitable habitat. 2) Shows the spread of acres and percentage				
1) All LAUs			2) Spread: Individual LAUs with the lowest to highest amounts of unsuitable habitat.	
Year/Decade 1	Acres (1000s)	Percentage	Acres (1000s)	Percentage
2010	29.6	2.2	0.0 to 4.1	0.0 to 11.8
2004	57.3	4.6	0.1 to 4.2	0.22 to 10.47
Source: USDA 2011e (2010 data)				

Other Critical Lynx Habitat outside of LAUs

Table Lynx-12 displays the current amount and percentage of unsuitable habitat in non-LAU areas (NLAs) in 2010.

Table Lynx-12: 1) Acres of unsuitable habitat on NFS land, and percent of NFS lynx habitat in NLAs that is unsuitable habitat - 2010		
NLA	Acres	Percentage
1	0	0
2	33	0.1
3	0	0
4	365	2.5
5	66	0.5
Source: USDA 2011i (2010 data)		

Under these conditions the Forest would not be able to manage lynx habitat on NFS lands in order to limit disturbance to be less than 15% (S-WL-1) or 30% (G-WL-3) of the lynx habitat in an unsuitable condition. This situation is the same as described in the Forest Plan Appendix E (USDA 2004, pgs E-4 and 5) for LAUs 44 and 46 that are exempted from Forest Plan direction S-WL-1 and G-WL-3 (USDA 2004).

Forest-wide Conditions

Indicator 3: Denning habitat

LAUs

The current (2010) amount and percentage of denning habitat (patches greater than 5 acres) in LAUs, Forest-wide, on Superior NF lands using the 2004 BA denning habitat model is approximately 549,507 acres and 48.3% of total forested lynx habitat. The distribution of denning habitat in Figure 6 is below the amount expected under the Range of Natural Variability in the Forest Plan (USDA 2004a).

Figure 6 – Distribution of potential denning habitat – USDA 2004b BA criteria

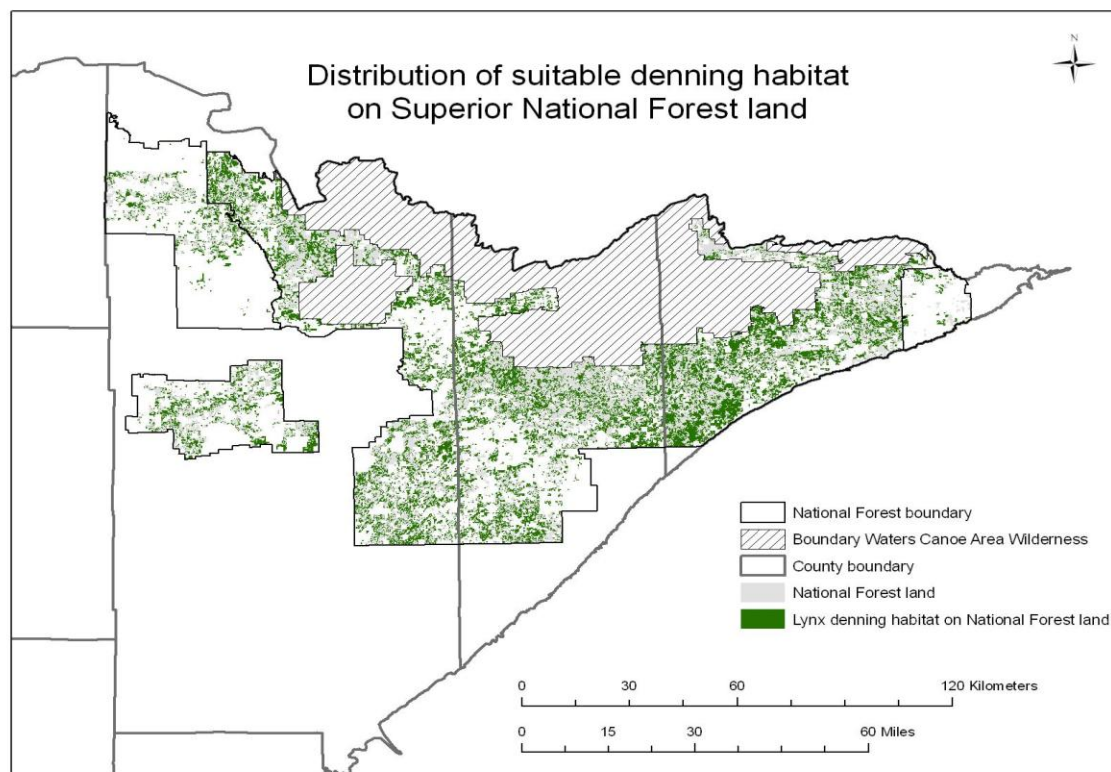


Table Lynx-9 indicates that in contrast to National Forest lands within LAUs, the amount of lynx habitat on NFS lands within non-LAU areas is a much lower percentage because the US Forest Service is a minority owner within four out of five NLAs (Table Lynx-9). In two of these areas the Forest would not be able to maintain or promote well-distributed denning habitat on at least 10% (G-WL-3) of the lynx habitat in a NLA since USFS ownership is less than 10% of the overall CHA (Table Lynx-9). In Area #3 Figure 6 indicates that denning habitat is very limited and sparse. But since these non-LAU areas are not LAUs they are exempt from G-WL-3. This situation is the same as described in the Forest Plan Appendix E (USDA 2004, pgs E-4 and 5) for LAUs 44 and 46 that are exempted from Forest Plan direction G-WL-4 (USDA 2004). Figure 6 indicates that denning habitat is more available in NLA #2 than the other four NLAs. Table-Lynx-20 (page 117) shows the acres and percentage of denning habitat on NFS lands in each NLAs.

Indicator 4: Connectivity habitat

The current (2010) amount and percentage of connectivity habitat (habitat with adequate canopy cover) in LAUs, Forest-wide, on Superior NF lands using the 2004 BA habitat model is

approximately 1,111,436 acres and 87.5 % of total forested lynx habitat. Figure 5 also indicates denning habitat is well connected across northeastern Minnesota.

Human Disturbance – Trails or Roads, ATV and Snowmobile Policy

Indicator 5: Miles of ATV trails allowed

Indicator 6: Miles of snowmobile trails allowed

Indicator 7: Miles of temporary road and Objective Maintenance Level (OML) 1 and 2 (low standard) system road planned

Indicator 8: Policy on cross-country use of ATVs and snowmobiles

Indicator 9: Policy on use of ATVs and snowmobiles on OML 1 and 2 roads

Table Lynx-13 displays the existing (2010) and past (2004) miles of recreational trails for Indicator 5: ATVs and Indicator 6: snowmobiles, for comparison.

Table Lynx-13: Indicators 5 and 6: Existing (2010) and Past (2004) miles of designated ATV and snowmobile trails on NFS and non-NFS lands within the Superior NF boundary.		
Year/Decade 1	Indicator 5: ATV Trails	Indicator 6: Snowmobile Trails
	Miles	Miles
2010	40	705 (1,562 – Forest-wide) *
2004	40	686 (1,509 – Forest-wide)
Source: USDA 2010b and USDA 2011e (2010 data). * = see narrative below		

An error in the calculating the designated and forest-wide (both NFS and non-NFS) snowmobile trail miles (Indicator 6) was discovered in the 2004 BA. The 2004 BA referenced the FEIS which specified that the...”Forest manages 705 miles of its 1,562 miles outside the BWCAW for snowmobile use” but the values of 686 miles and 1,509 Forest-wide were erroneously entered into the 2004BA (USDA 2004a FEIS 3.8.44, and 2004b BA). To confirm the FEIS numbers GIS data and recreation department records were reviewed. The error was an early estimate that was not corrected in the 2004 final BA. Efforts to track and update route mileage are ongoing and will be reviewed on an annual basis.

Table Lynx-14 displays the existing (2010) and past (2004) Forest-wide miles of OML 1 and 2 roads and temporary roads for Indicator 7: Total miles of low standard roads - OML 1 and 2 roads and temporary roads, for comparison.

Table Lynx-14: Indicator 7: Total miles of low standard roads - OML 1 and 2 roads and temporary roads					
Year	Units	OML 1	OML 2	Total OML 1 & 2	Temp Roads
2010	miles	948	979	1,927	158
2004	miles	883	867	1,750	432
Source: USDA 2010b and USDA 2011e (2010 data)					

Between 2004 and 2010 there has been an increase of 77 miles of OML 1 and 123 miles of OML 2 roads, an increase of 10% in the first six years of Decade 1. While OML 1 and 2 roads are measured, temporary roads are not, but estimates are derived from a formula of 5.59 miles per 1,000 acres of vegetation management treatments (USDA 2004 FEIS F-21). Temporary roads are

no longer tracked since they are not part of the maintained Forest road system. However, temporary roads can be estimated for reasonably foreseeable projects, and the potential effects of temporary roads to lynx and lynx critical habitat are addressed at the project-level in consultations with the US Fish & Wildlife Service.

Indicator 8: Policy on cross-country use of ATV trails and snowmobiles

Indicator 9: Policy on use of ATV and snowmobiles on OML 1 and 2 roads

The current policy on ATV and snowmobile use on low standard roads or cross-country has not changed between 2004 and 2010. In summary, the policy for the Superior NF is:

- Cross-country ATV use is prohibited. Cross country snowmobile use is “allowed”. ATV use is “allowed” on all OML 1 and 2, and unclassified roads.

“Allowed” means RMV use on roads and trails, is generally allowed. However, restrictions on the season of use, type of vehicle, vehicle equipment, or types of activities that would be specified in permits or Forest supervisor orders.

3.6.2 - Environmental Consequences

3.6.2.1 - Resource Protection Methods

All resource protection methods and substantive guidance incorporated into the 2004 Superior National Forest Plan remain in place both before and since the designation of lynx critical habitat. The procedural guidance to conduct certain analyses at the project level remains in place. There is no change from the 2004 BA that procedural guidance does not constitute Plan direction, and that all appropriate procedures will be completed to contribute, ensuring that full consideration of lynx conservation will occur during the remaining Plan implementation period. The Superior National Forest will continue to work closely with the US Fish and Wildlife Service to use resource protection methods for lynx and critical habitat conservation.

As stated in the 2004 BA, the Superior NF Forest Plan was designed to provide well-distributed and connected habitat for lynx over short and long-term periods. While the Forest provides and maintains high quality habitat in the short-term, the long-term persistence of lynx may be dependent on biological factors that are beyond the control of the Forest Service.

The management direction in the Forest Plan, specific to lynx, only applies to lynx habitat on NFS lands within the 47 designated LAUs. Direction for lynx refugium management in the BWCAW portion of the Superior NF is described in **Section 3.6.2.2**. However, habitat conditions on all ownerships in each LAU are assessed to determine the existing habitat condition and potential throughout one or more LAUs that an individual project may impact. Including habitat potential on non-NFS lands could lead to conservation agreements with other landowners. Assessing habitat potential on non-NFS lands may indicate management options or opportunities that may not exist on federal lands alone. If lynx habitat conditions on non-NFS lands are expected to remain stable that acreage may be included in lynx habitat assessment calculations. Examples can include non-governmental organizations like The Nature Conservancy or state old-growth reserves, parks, etc. that are managed for long-term stability.

Key integrated resource management direction that is relevant for lynx conservation and critical habitat continues to be found in Chapter 2 of the Forest Plan (USDA 2004a and b). This direction is listed in the following sections of the Forest Plan and 2004 BA.

Threatened and Endangered Species (general)

D-WL-3: Aquatic and terrestrial wildlife habitats and species populations, while constantly changing due to both management activities and naturally occurring events, are present in amounts, quality, distributions, and patterns so that National Forest lands (c) Contribute to the conservation and recovery of federally-listed threatened and endangered species and the habitats upon which these species depend.

O-WL-4: Maintain, protect, or improve habitat for all threatened and endangered species by emphasizing and working towards the objectives of federal recovery plans and management direction in Forest Plans.

O-WL-5: Seek opportunities to benefit threatened and endangered species from the spectrum of management activities on NFS land.

O-WL-6: Reduce or eliminate adverse effects on threatened and endangered species from the spectrum of management activities on NFS land.

O-WL-7: Minimize the building or upgrading of roads in areas that are important for threatened and endangered species habitat and for habitat connectivity.

Canada lynx

O-WL-8: Promote the conservation and recovery of Canada lynx and its habitat.

O-WL-9: In LAUs in NFS land, manage vegetation to retain, improve, or develop habitat characteristics suitable for snowshoe hare and other important alternative prey in sufficient amounts and distributions so that availability of prey is not limiting lynx recovery.

O-WL-10: In LAUs in NFS land, manage vegetation to provide for foraging habitat in proximity to denning habitat in amounts sufficient to provide for lynx.

O-WL-11: Maintain and, where necessary and feasible, restore sufficient habitat connectivity to reduce mortality related to roads and to allow lynx to disperse within and between LAUs on NFS land.

O-WL-12: Through partnerships with other agencies and landowners, participate in cooperative efforts to identify, map, and maintain or restore, where feasible, linkage areas that provide habitat connectivity sufficient to allow lynx to disperse between disjunct blocks of lynx habitat at larger landscape scales (for example, among National Forests in the Great Lakes region).

O-WL-13: Maintain or improve the natural competitive advantage of Canada lynx in deep snow conditions. Snow compacting activities (such as snowmobiling, snowshoeing, skiing, dog sledding) are planned and accommodated in areas best suited to the activity while maintaining large, interconnected areas of habitat with little or no snow-compacting, recreational activities.

O-WL-14: Through coordination with other agencies, participate in cooperative efforts to reduce, to the extent possible, the potential for lynx mortality related to highways and other roads within the proclamation boundary of the National Forest.

O-WL-15: In the Boundary Waters Canoe Area Wilderness Refugium lynx habitat conditions will predominantly result from natural ecological processes such as fire, wind, insects, disease and vegetation community succession. However, some active management, with methods compatible with wilderness values, may be needed to restore or maintain desired vegetation characteristics. Lynx and prey populations will fluctuate in response to changing environmental conditions.

G-WL-1: Within LAUs on NFS land, moderate the timing, intensity, and extent of management activities, if necessary, to maintain required habitat components in lynx habitat, to reduce human influences on mortality risk and inter-specific competition, and to be responsive to current social and ecological constraints relevant to lynx habitat.

G-WL-2: Provide for the protection of known active den sites during denning season.

G-WL-3: Limit disturbance within each LAU on NFS land as follows: if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable conditions should occur as a result of vegetation management activities by the National Forest.

S-WL-1: Management activities on NFS land shall not change more than 15% of lynx habitat on NFS land within an LAU to an unsuitable condition within a 10-year period.

G-WL-4: Within an LAU, maintain or promote well-distributed denning habitat in patches generally larger than five acres, comprising at least 10% of lynx habitat. Where less than 10% of forested lynx habitat within an LAU provides denning habitat, defer those management actions on NFS land that would delay achievement of denning habitat structure. *Only LAUs 44 and 46 are exempted from this guideline.*

G-WL-5: Following a disturbance on NFS land greater than 20 contiguous acres (such as blow-down, fire, insect, or disease) that could contribute to lynx denning habitat, generally retain a minimum of 10% of the affected area on NFS land unless salvage or prescribed fire is necessary to address human health and safety (such as in the Wildland Urban Interface) or scenic integrity. *Only LAUs 44 and 46 are exempted from this guideline.*

S-WL-2: In LAUs on NFS land allow no net increase in groomed or designated over-the-snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas.

G-WL-6: Where a designated trail for snow-compacting activities is desired within LAUs, the proposed route should be planned to protect or improve the integrity of lynx habitat and minimize snow compaction in lynx habitat. The trail should be designed to:

Move recreational use away from more sensitive or better quality lynx habitat,
Concentrate use within existing developed areas rather than developing new recreational areas in lynx habitat, and or be located within the outer boundaries of a currently used road and trail system.

G-WL-7: For newly constructed snow-compacting trails, effectively close or restrict to public access those trails, OML 1, OML 2, temporary, and unclassified roads that intersect the new trails unless these trails or roads are being used for other management purposes.

S-WL-8: Within LAUs generally maintain road and snow-compacting trail densities below 2 miles per square mile to maintain the natural competitive advantage of Canada lynx in deep snow. Where the total road and regularly-used snow-compacting trail densities are greater than 2 miles per square mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline “roads” include all ownerships of classified and unclassified roads and “regularly-used trails” are those that are used most years for most of the snow-season.

G-WL-9: Dirt and gravel roads that are under the jurisdiction of the National Forest and that traverse lynx habitat on NFS land (particularly those roads that could become highways) should generally not be paved or otherwise upgraded in a manner that is likely to lead to significant increases to lynx mortality or substantially impedes movement and dispersal.

If the dirt and gravel roads described above are upgraded or paved in order to meet human health and safety or other environmental concerns and essential management needs, conduct a thorough analysis on effects to lynx and its habitat to determine minimum road design standards practical (including measures to minimize traffic speeds), to minimize or avoid foresee ably contributing to increases in human activity or adverse impacts to lynx and its habitat.

Recreation

O-RMV-1: A maximum of 90 additional ATV trail miles and 130 snowmobile trail miles with associated trail facilities (trailhead parking, signs, toilets, etc.) may be added to the designated National Forest Trail system.

S-RMV-1: Motorized recreation use of designated trails is prohibited unless the trail is designated open for specific motorized uses such as for ATVs, OHMs, and snowmobiles.

S-RMV-3: Cross-country OHV travel is prohibited. Standards and guidelines for cross-country snowmobile use are described in Chapter 3 because direction for that use varies by Management Areas. *Summary from Chapter 3:* For most Management Areas: Cross-country snowmobile use is generally allowed unless prohibitions or restrictions are needed for resource protection to meet management objectives. *For Unique Biological, Research Natural, and Wilderness:* Cross-country snowmobile travel is prohibited.

G-RMV-4: RMV use will generally be allowed on existing unclassified, OML1 and OML 2 roads (Except ORVs will generally be prohibited on OML 1 roads). Roads that are determined through site-specific analysis to have immitigable resource and social concerns and/or do not meet management objectives would be effectively closed. (See exceptions for Management Areas: wild segments of eligible Wild, Scenic, and Recreational Rivers, semi-primitive non-motorizes recreation, Research Natural Areas, candidate Research Natural Areas, and Unique Biological Areas).

Transportation System

O-TS-2: Few new OML 3, 4 and 5 roads will be constructed.

O-TS-3: New roads built to access use land for resource management will be primarily OML 1 or temporary. (*Except for road straightening, or possibly short access roads to boat launches and similar projects, no new OML 3, 4 and 5 roads would be built during the next couple of decades*)

S-TS-3: As soon as access use is completed, stabilize temporary roads and effectively close them to motorized traffic. Vegetation will be established within 10 years after the termination of the contract, lease, or permit.

S-TS-4: Decommission unclassified roads that are not needed in the Forest road and trail system and special use permitted roads that are no longer needed. Decommissioning will make the road unusable by motorized vehicles and stabilize the roadbed.

G-TS-12: On existing OML 1 roads, an effective barrier will generally be installed as needed to prevent use by highway-licensed vehicles and ORVs, ATV and OHM use may continue to be allowed on some existing OML 1 roads.

Vegetation

Lynx habitat requirements were considered in the development of much of the vegetation management direction in the Superior NF Forest Plan. Based on this direction vegetation management influences, at both the coarse and fine-scales, lynx critical habitat amounts, quality, and distribution. This vegetation management direction (including desired conditions, objectives, Landscape Ecosystem objectives, standard and guidelines and Management Area specific direction)) is comprehensive and located in Chapters 2 and 3 of the Forest Plan.

Insects, Disease and Disturbance Processes

The Forest Plan (Chapter 2 – Vegetation, Insects, Disease, and Disturbance Processes) promotes the management of ecosystems to allow a desirable balance of natural processes across the landscape. The Plan recognizes the potential for insect and disease outbreaks, fire and blow-down events to provide an important role in maintaining healthy resilient ecosystems. The Plan also recognizes the potential for these outbreaks and/or events to occur in sizes, amounts and frequencies when and where they may adversely affect forest resources or human safety. Projects that may manage these disturbances include salvage harvest, wildfire fire suppression and pre-suppression, forest restoration, fuels reduction treatments, insect and disease control treatments. These probable projects that are proposed through Forest Plan objectives but were not listed in appendix D of the 2004 BA (USDA 2004a and b). These types of projects may impact lynx and its critical habitat and would address lynx recovery needs.

3.6.2.2 - General Effects

The Superior National Forest Plan proposes certain land management practices or other activities that may influence lynx and its critical habitat. Vegetation management and human access from recreation management, and road and trail construction are the primary proposed activities (actions) that could result in a risk to lynx and lynx critical habitat. Depending on the timing, frequency, intensity, amount, or other conditions, the impacts may vary between similar projects.

All projects involve project-level planning and analysis to address potential impacts to lynx and critical habitat. As indicated earlier other probable practices were described and analyzed in the Forest Plan EIS (USDA 2004), but not listed in Appendix D of the 2004 BA.

Risk factors affecting lynx productivity, mortality, movement and dispersal, and other large-scale factors are described in the previous Section 3.5, and in greater detail in the Lynx Conservation Assessment and Strategy (LCAS) in Chapters 2 to 4 (LCAS 2000). The primary potential general effects (direct, indirect, and cumulative effects) from potential proposed land management practices or other human activities on NFS lands have not changed since 2004, and are summarized below.

The 2004 BA provided estimates of the amount of land management practices that were predicted to occur during Decades 1-4. This BA will display the amount of land management practices that have occurred in the first 5 years of Decade 1. The remaining practices are assumed to remain within the estimates established in the Forest Plan EIS (USDA 2004) therefore their potential impacts to lynx and critical habitat are addressed programmatically in this BA.

Vegetation Management

The Forest Plan proposes vegetation management activities in the following program areas that may affect lynx critical habitat:

Timber and Wildlife

Appendix D of the Forest Plan (USDA 2004) displays proposed and probable practices for some vegetation management activities. These include:

- Timber harvest for Decades 1 and 2 using a variety of treatment methods (defined in the Forest Plan glossary); thinning, clear cutting, shelter wood, partial cutting, and uneven-aged management (Table APP_D2).
- Wildlife restoration projects – These may include vegetation treatments such as cutting trees, shearing, burning, seeding or planting.

Prescribed Fire

A variety of prescribed fire treatments were described in the Final EIS (USDA 2004). These include the use of fire:

- to achieve ecological objectives,
- for hazardous fuel reduction, and
- for site-preparation after timber harvest.

These treatments would apply fire as controlled surface fires and not as high severity stand-replacement fires.

Mechanical Treatments

Although not described in detail in the 2004 BA other probable practices include a variety of mechanical treatments using machinery to gather and pile excess fuels for disposal as biomass or for pile burning.

Natural Processes

Natural processes that occur across the landscape and affect lynx and critical habitat include vegetative succession, wildfire, wind storms, insect and disease outbreaks, flooding, and nutrient cycling through the decomposition of vegetation. The occurrence, locations, and scope and scale of these natural processes are unpredictable. If large-scale examples of these events occur they would be addressed as projects developed to address these events, or as parts of other vegetation management projects.

While not a disturbance event, vegetation succession is included in the assessment of effects. The Forest Plans' forest type and age vegetation objectives in Chapter 2 indicate the amounts and types of vegetation succession that is expected to occur during the Forest Plan planning cycle of approximately 20 years (USDA 2010f). These natural processes and events contribute to both short and long-term lynx critical habitat conditions.

Effects

The LCAS (2000) describes both direct and indirect effects that may impact lynx, lynx habitat and prey species habitat. There has been no identification or suggestion of additional effects

indicators by the US Fish and Wildlife based on the designation of critical habitat for lynx. The potential direct and indirect effects to lynx and critical habitat from the described vegetation management practices and natural processes may include the following direct and indirect effects (LCAS 2000 and 2004 BA – **Section 4.6.2.2, pgs 134-136**).

Direct Effects:

1. Local travel, resting, and foraging use patterns could be disrupted or a lynx may be temporarily displaced.
2. Vegetation management activities may disturb a denning female, and if she has kittens she may be forced to move them to another den. It is also possible that management activity may accidentally kill or harm a lynx.
3. Structure, composition, and mosaic of forested landscapes are changed. These changes include both stand and landscape-scale habitat elements such as forest type and age, and within-stand features such as large coarse woody debris, and canopy, shrub or forb layer structure.

Discussion: The risk of direct effects to lynx travel, resting, foraging, and denning is expected to be low. The majority of the Superior National Forest (2,125,931 acres) is within the designated lynx critical habitat area. This large area combined with the relatively low population of resident lynx and the varied landscape conditions all indicate the potential and number of lynx expected to be directly impacted by vegetation management practices is expected to be low. In the event a lynx may be displaced from an area that it uses any stress from the displacement or disruption of use patterns is expected to be low.

Management direction (**G-WL-2**) remains in place to protect known lynx dens and denning habitat modeling (see **Section 3.5.4.3** - Moen et al 2008) allows project areas to be evaluated for denning habitat. This management direction, analysis tool, and the scattered nature of timber harvest, prescribed fire and other vegetation management projects across the breadth of the Forest reduces the risk to lynx denning and/or denning habitat.

The risk of direct effects to lynx critical habitat is expected to be low. Direct changes to forest composition and structure from vegetation management practices is expected to be either localized and relatively short-term or longer-term (decade 1 or more) depending on the scope, scale and intent of management practices and direction. Forest plan direction and with the amounts and distribution of habitat in the 47 LAUs on the Superior NF, is expected to limit impacts to lynx, maintain critical habitat and continue to provide for lynx recovery. This has proven to be the case during the five years since the Forest Plan has been implemented, and is expected to continue.

Indirect Effects:

1. Vegetation community changes at both landscape or site-level scales generally result in creating, enhancing, maintaining, reducing or eliminating suitable habitat conditions. The changes that affect lynx most are those that influence forage, denning, connectivity habitat at both landscape and site-level scales.

2. Lynx may be hunt in large openings created by vegetation management activities within forested habitats, even though they commonly use edges. Activities that result in distance to cover greater 100m (325 feet) may restrict lynx movement and use patterns until forest regeneration occurs.
3. Following timber harvest, remaining large woody debris or debris piles provide some level of habitat for snowshoe hares and other small mammals, primarily as cover. Where debris is burned this opportunity for use is reduced or eliminated.
4. Changes to vegetation communities at landscape and local-scales may alter animal communities and wildlife diversity. This may result in altered interactions among species and influence competition, predation, dispersal, colonization, or herbivory.
5. Clear cuts, large burns, or other vegetation management activities could reduce or eliminate suitable habitat by changing, reducing, or eliminating forage or adequate cover for lynx and its prey. Though these effects are usually temporary, they cause lynx to increase their foraging range. Other harvest methods may have similar effects depending on several factors, including soil, extent, machinery, residual vegetation and its structure.
6. Clear cuts, large burns, or other vegetation management activities that regenerate forests could result in future quality snowshoe hare and, eventually other types of lynx habitat such as connectivity or denning habitat.
7. Treatments that only partially remove forest over-story (thinning, partial over-story removals, surface prescribed fires), generally have similar impacts to treatments that create large openings with low tree density (i.e., clearcuts or large burns). However, for some treatments, impacts may be fairly short-term. The degree of stem removal, along with site characteristics will determine whether snowshoe hare habitat is improving or restored by subsequent reinitiation of understory conifers and shrubs.
8. Natural disturbances and natural vegetation succession generally will continually provide habitat suitable for lynx unless a disturbance is so extensive that it temporarily reduces or eliminates hare habitat. Habitat quality for snowshoe hare, however, could diminish in areas that have no disturbance since young forests with conifer can provide high-quality habitat.
9. Construction of roads that are plowed in winter for harvest and other vegetation management treatments may give a competitive advantage to other species such as bobcat or coyote.
10. Increased human access that increases potential for incidental trapping or shooting.

Discussion: The risk to lynx and critical habitat from indirect effects is expected vary because of the range of potential indirect effects. Some indirect effects are expected to have greater long-term influences on lynx, critical habitat and lynx recovery than shorter-term direct effects. Both management activities such as timber harvest and prescribed fire, or natural disturbances like large-scale wildfire or wind storm events can change lynx habitat for several years or decades based on the scope and scale of impacts to habitat type, composition and structure. Large-scale severe impacts to denning habitat and connectivity may take decades to recover to a suitable condition. Less severe effects such as timber harvest and prescribed fire may allow hare habitat to recover faster due to project design and vegetative re-growth depending forest type and ecological setting.

However, some indirect effects can also have short-term effects that are managed through mitigation measures such as seasonal road closures or use restrictions where human access is increased. The Forest Plan and 2004 BA assessed whether sufficient amounts of habitat would be provided over time. Both documents compared coarse-filter vegetative conditions (primarily vegetative type and age) to both management direction (where specifically provided) and the Range of Natural Variability (RNV) (where not specifically provided for).

There is no indication that after five years of Forest Plan implementation that the projected coarse-filter vegetative conditions are in need of change. Forest Plan Monitoring and Evaluation Reports (USDA 2009a) indicate that management direction continues to provide sufficient amounts of lynx habitat (critical habitat) above, consistent with, or below the habitat conditions in RNV projections (USDA 2004).

The Forest Plan direction has and all indications will continue to maintain conditions suitable to support lynx and critical habitat during the planning cycle as indicated in the LCAS (LCAS 2000). Indirect effects from roads and access developed for vegetation management activities are described in the next section: **Human Disturbance**.

Human Disturbance: Winter and non-winter dispersed recreation management and low standard or temporary road construction

Forest-wide Effects

The LCAS (2000) describes that increasing human use of National Forests and human developments in lynx habitat both adjacent to and in mixed-ownership areas increase the potential for impacts to lynx and the species recovery. The LCAS indicated that indirect effects were a potential higher risk than direct impacts. One key indirect effect is that increased snow compaction from winter routes used for human access would allow competing carnivores such as bobcat and/or coyote access into previously inaccessible lynx habitat.

Direct Effects:

1. Local travel, resting, and foraging use patterns could be disrupted or a lynx may be temporarily displaced.
2. Vegetation management activities may disturb a denning female, and if she has kittens she may be forced to move them to another den. It is also possible that management activity may accidentally kill or harm a lynx.

Discussion: As with the previous Vegetation Management section the risk of direct effects to lynx denning is expected to be low. With the majority of the Superior National Forest (2,125,931 acres) within the designated lynx critical habitat area, the relatively low population of resident lynx based on research and survey results, and varied landscape conditions the potential, and number of lynx expected to directly impacted by vegetation management practices is expected to be low. In the event a lynx may be displaced from an area that it uses any stress from the displacement or disruption of use patterns is expected to be low.

Management direction (**G-WL-2**) remains in place to protect known lynx dens, and denning habitat modeling (see **Section 3.5.4.3** - Moen et al 2008) allows project areas to be evaluated for denning habitat. This management direction, analysis tool, and the scattered nature of timber harvest, prescribed fire and other vegetation management projects across the breadth of the Forest reduces the risk to lynx denning and/or denning habitat.

Indirect Effects:

1. Construction of new designated winter recreational trails, new designated trails, and policies that allow recreational vehicle uses on low standard roads or cross-country all facilitate access to historical lynx habitat by competitors (or predators).
2. Increased human access from new trails or road-riding opportunities increases potential for incidental trapping or shooting.
3. Increased planned access can facilitate increased access (generally on old closed or unclassified roads or cross-country) to areas previously would have been as accessible. This would compound impacts of competitors or opportunities for incidental trapping or shooting.

Discussion: The LCAS and National BA did not consider direct effects from road and trail construction as a risk factor to lynx in the Great Lakes geographic area. At a National Forest-scale, road and trail construction would remain a very low risk due to the random nature of the effect. However, through the first decade of Forest Plan implementation and over a longer term, road and trail construction may cumulatively become a measureable risk. The effects are expected to be long-term because once on the landscape, recreational trails and low standard open roads are generally not removed and access is generally not prohibited. The Forest Plan directs the planning for and implementation of consolidated motorized use. In addition, the Forest Plan continues to direct that no net increase in designated snow-compacting trails shall occur. Therefore, there should not be an increase in other-predator access into lynx habitat and subsequent competition with lynx from proposed and approved winter recreation routes. Summer ATV trails will continue to be counted in trail densities since there is no management provision in the LCAS or Forest Plan for a “no net increase” for these types of trails.

Low-standard closed or temporary roads have short-term impacts because these roads are generally closed immediately after their intended use ends. Some low-standard roads are always open depending on the management activity that they support (e.g. temporary roads into timber sales). The number of low-standard roads and their overall mileage will vary annually because of the number of operational management activities across the Forest. The Forest Plan requires the effective closure of these roads, especially where they intersect newly-constructed trails so that motorized recreational use is limited to designated routes.

The Forest Plan provides specific objectives (Chapter 4) for monitoring and evaluating the results of implementing the Forest Plan management direction of roads and trails for either vegetation management or human recreational use. The goal or purpose of decommissioning roads is to make the road “disappear” and render it not accessible to motorized vehicles from the beginning of the road to the point where the main Forest System road is not visible (USDA 2010g). These

are emphasized in the Plan because of their key importance for the conservation and recovery of lynx and critical habitat.

The effectiveness of road closures has been monitored by the Forest monitoring program (USDA 2010g). Since 2004 approximately 34 miles of road have been decommissioned and an additional 109 miles of roads approved for decommissioning but not yet accomplished, are planned. When these planned projects are fully implemented, a total of 143 miles of roads will have been decommissioned across the Forest. The Forest Plan objective is to decommission approximately 80 miles of road by 2014 (USDA 2010g).

In 2009 the “Nira Stewardship Project” was evaluated to determine the effectiveness of road closure methods used on the Forest to restrict large and small motorized vehicle use. Twenty-two (81%) of the 27 closures were found to be totally effective. At five sites road obliteration was not totally successful due to the poor survival of planted woody vegetation. While most of these plantings were not successful at these five sites, the report concluded that the closures were still effective in keeping motorized use to a minimum (USDA 2009b).

While site conditions differ at different locations across the Forest similar results are expected with successful application of road closure methods elsewhere on the SNF. Road closure direction in the Forest Plan expected to minimize or eliminate impacts caused by prior use (vegetation management projects) to lynx and critical habitat on the Forest. An example of typical road closure methods is displayed in Appendix B.

In addition, the active monitoring of illegal user created motorized trails has been ongoing. Since 2004 over 40 user-created trails have been discovered and documented. Once user-created trails are found, their location and resource impact information is reported to decision-makers and Law Enforcement. During 2008 Law Enforcement recorded 22 incident reports and issued 17 warnings and citations related to recreation motor vehicles (USDA 2010g).

Boundary Waters Canoe Area Wilderness (BWCAW):

On the Superior National Forest, the BWCAW serves as an important habitat refugium in northeastern Minnesota that connects with lynx habitat in Ontario, Canada. The quality, quantity and distribution of lynx habitat in the BWCAW is primarily influenced by natural disturbance events and natural succession, although some prescribed fire management activities have and do occur within the wilderness area.

The BWCAW provides large amounts of lynx habitat, but is not managed using the LAU approach, and LAU management direction does not apply to the wilderness area. The 2004 BA concluded that the BWCAW Refugium met the direction for minimum habitat conditions established for LAUs. Table Lynx-15 displays the conditions in the 2004 BA as well as the current 2010 conditions.

Table Lynx-15: Lynx habitat types: 2004 and 2010 lynx habitat conditions on NFS lands in the BWCAW

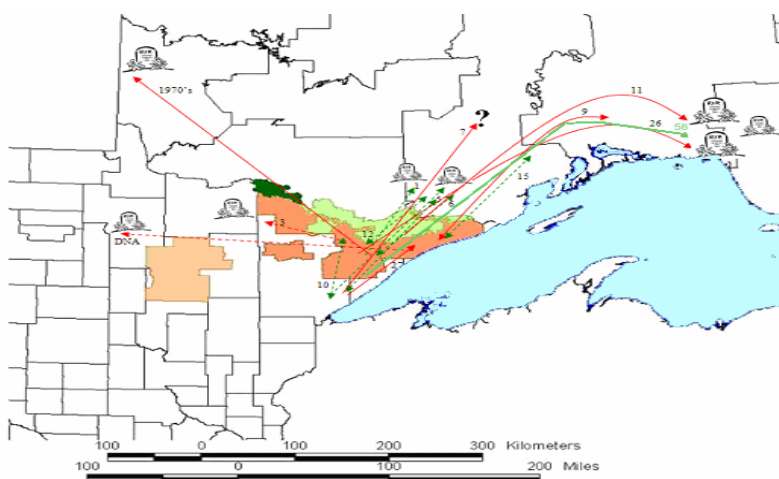
Habitat Indicators	2004 Acres	2004 - % of NFS lynx habitat	2010 Acres	2010- % of NFS lynx habitat
Total lynx habitat on NFS lands in BWCAW	755,000	-	755,000	-
Forested habitat	728,000	96	728,000	96
Hare habitat	628,000	83	667,264	88
Unsuitable habitat	5,000	<1	1,273	<1
Denning habitat	481,000	66	481,000	66
Denning habitat > 5 acres	458,000	63	458,000	63

Source: USDA 2004b BA, USDA 2011e (2010 data)

The 2004 BA described the amounts of lynx habitat indicators on NFS lands in the BWCAW. That data reflected conditions after the 1999 wind storm event that resulted in the creation of approximately 165,000 acres (22% of the total BWCAW) of new seedling/sapling forest was created. Using the habitat model parameters in the 2004 BA (USDA 2004b - Appendix D), those acres would have been considered unsuitable for snowshoe hare for three or more years. In the 11 years since the windstorm, the majority of those acres will have become suitable for hares except for those acres that have been prescribed burned to reduce down wood fuel loading and the risk of wildfire. Approximately 36,067 acres of prescribed fire has occurred since the 2004 BA (FY05-10), of which 26,118 acres have become suitable leaving 9,949 acres still unsuitable. An additional 35,537 acres of disturbance have occurred due to natural disturbances such as fire and wind storms since 2004 (USDA 2010I). Approximately 34,264 acres have become suitable leaving approximately 1,273 acres as unsuitable hare habitat.

The BWCAW serves as important connectivity habitat between Canada and lynx habitat in the general forest portion of the Superior National Forest. Using ongoing lynx telemetry research data dating back to 2003 as well as data from a prior study (Burdett 2008), Moen et al. (2010) found that many lynx radio/GPS-collared in the SNF portion of northern Minnesota travel through the BWCAW to and back from Ontario (see Figure 7).

Figure 7 – Lynx Movement Patterns



Other Risk Factors

The 2004 BA described similar effects from other risk factors identified in the LCAS (2000) for the Great Lakes Geographic Area. There is no change in these factors but they are reviewed in this BA since critical lynx habitat was not designated in 2004.

1. The following activities or programs were not specifically proposed by the Forest Plan in 2004, though they are allowed, may have occurred since 2004 or are likely to occur within the remaining years of the Forest planning cycle.
 - Minerals exploration has occurred since 2004.
 - Mining-The Polymet mine is proposed. Future mine proposals are possible.
 - High standard road construction – Highway 1 has undergone improvement.
 - Upgrading of lower standard roads – This activity has occurred since 2004.
 - New utility corridors development - None
 - Recreation developments such as campgrounds - None
 - Land adjustment programs – Land exchanges have occurred
 - Wildfire management – Prescribed fire in vegetation management project areas has occurred.
 - Human developments such as large resorts - None
2. The following activities or programs are generally not applicable to the Superior National Forest either because they rarely occur on NFS lands, they are outside the control of the Forest Service, or they have a minor impact on Forest Service lands. Exceptions have been evaluated at the project-level, and some examples are given below.
 - Livestock grazing - None
 - Fragmentation and/or the conversion from lynx to non-lynx habitat of non-NFS land at the Great Lakes Geographic Area scale – Non-NFS land developments continue
 - Major highway construction – Highway 53 realignment
 - Ski resort development – No new developments on NFS lands
 - Predator control – Cooperating agency with USDA –Animal and Plant Health Inspection Service (APHIS) for animal damage management
 - Development on non-NFS land - Non-NFS land developments continue.
3. The following activities or programs would be very minor in extent or unlikely to have a measureable impact on lynx (not all of these were identified as risk factors in the LCAS):
 - Pre-commercial thinning, pruning, or tree and stand release
 - Site preparations or tree planting
 - Recreation developments such as water access

Some of the above activities or programs that are allowed, but not proposed in the Plan, potentially could have substantial impacts on lynx and critical habitat. The activities or programs that have occurred since 2004 have individually been analyzed for impacts to lynx. Consultations

on Forest projects have taken place with the US Fish & Wildlife Service both before and after the designation of critical habitat. This insures that lynx and critical habitat conservation is fully considered and that appropriate management direction and mitigation measures are incorporated into the final project design.

Climate Change

As stated in the 2004 BA the LCAS did not address the potential impacts of climate change and did not specify climate change in its list of risk factors. However, if climate change impacts northern Minnesota vegetation conditions adverse impacts to lynx and critical habitat may occur. For example, boreal forest and the deep snow conditions and other boreal ecosystem flora and fauna could move north into Canada and disappear from the Superior National Forest.

The potential implications of climate change to northern Minnesota are difficult to predict but continue to be studied as follows. Galatowitsch et al. (2009) discussed potential habitat change scenarios in Minnesota based on an assessment of climate change projections from 16 models with varying scale and intensity. Galatowitsch et al. (2009) predicts that climate effects to Minnesota forests may include warmer summers and more frequent droughts, with an eventual disappearance of the boreal biome. However, none of these potential projections for northern Minnesota have the potential to occur for several decades or to 2100 (Galatowitsch et al. 2009, Frelich 2010 pers., comm.) which is well outside the current Forest planning cycle. There is also uncertainty as to which of these projections may come to pass over time. In the next Forest Plan revision, which will occur between 2015 and 2020 time period, relevant Range of Variability (RNV) science is anticipated to be reviewed and incorporated into Forest Plan direction. How this affects lynx critical habitat management is undetermined at this time.

At the Superior National Forest level how Forest management activities affect climate change are being studied (USDA 2011c). Starting 2010 the Superior National Forest funded an ongoing Climate Change ARRA (American Renewal and Recovery Act) project conducted by the Northern Research Station (NRS) and University of Minnesota. These preliminary results focused on carbon storage over a 100-year period.

1. Timber harvest is not making a big difference in total carbon storage. For all harvest scenarios evaluated in their carbon storage model (No harvest, 40%, 60%, and 100% of Forest Plan implementation), there is not much difference in total carbon storage, particularly between 60% of implementation (where we are now) and full implementation.
2. A minor change in natural disturbance rates (from 1 to 3%) creates a larger effect than harvest and has the potential to overwhelm management impacts on forest carbon.
3. Results suggest that maintaining or increasing forest-wide carbon stocks will be very challenging based on uncertainty of disturbance rates.
4. Across all eight forest types, the majority of carbon storage occurred in soil organic matter.
5. A minor change in natural disturbance rates creates a larger effect than harvest.
6. Aspen forests store less carbon than other forest types.

The next steps in this ongoing study include:

1. Factor in carbon sequestration or CO₂ uptake with their carbon storage data and model the carbon budget for the SNF. Younger actively growing forests have greater sequestration rates than older forests.
2. Display carbon budget differences (if any) in 20-year increments rather than just 100-year intervals.
3. Continuing field data collection in 2011 to fine tune model inputs.

Galatowitsch et al. 2009 discussed that ecological assessments are a productive first step in effective climate change planning. Like in the 2004 BA, for analysis purposes this BA assumes that current lynx habitat conditions will persist through the remainder of the Forest Planning cycle. While the 2004 BA did not analyze climate change, the Superior Forest Plan provides the direction in Chapter 2 – Forest-wide Management Direction, Chapter 3 – Management Area Direction, and in Chapter 2 – Landscape Ecosystem Objectives for the Northern Superior Uplands Landscape Ecosystems (pgs 2-55 through 2-78). This combined direction drives the assessment of projects through mid-level analyses and smaller scale analyses. Through these assessments and subsequent implementation of vegetation management projects the Superior National Forest would maintain and protect the resistance, resilience and redundancy of lynx and critical habitat during the Forest planning cycle.

3.6.3 - Direct and Indirect Effects

There is no change in the assumption from the 2004 BA that the Forest Plan will provide variable amounts of lynx denning habitat and sufficient amounts of foraging habitat in LAUs by decade. As also stated, there has been and will continue to be variable amounts of human disturbance in LAUs by decade, and Forest Plan direction is likely to provide adequate protection through the planning cycle.

The direct, indirect and cumulative effects on lynx, based on the lynx environment and analysis indicators, and risk factors are discussed in Section 3.5.1. In 2004 the Revised Forest Plan was assessed by the proposed management direction for moving toward or away from LCAS management strategies for habitat and human-use management. This section provides a summary of current effects on the key indicators of lynx habitat, and a comparison with the effects in 2004.

Effects on Lynx Critical Habitat – Forest Conditions from Vegetation Management Activities

Direct Effects:

Table Lynx-16 displays the estimated acres of vegetation treatments during Decade 1 including the predicted values from the 2004 BA, the actual acreage of vegetation management treatments as of 2010, and the percentage of the predicted by 2010. As in 2004 treatments can occur on the same acres as harvested areas have excess fuels burned and/or acres site prepped for reforestation at later dates.

Table Lynx-16: Vegetation treatment acres during Decade 1 – Forest Plan and actual 2010 acres		
Vegetation Management Treatments	Forest Plan Alternative Mod E Acres	2010 Acres (% of 2004)
Timber Harvest	130,967	20,741 (16%)
Site preparation (mechanical and prescribed fire)	6,700	5,638 (84%)
Prescribed fire for ecosystem disturbance	6,200	6,687 (108%)
Prescribed fire for hazardous fuel reduction	66,100	22,097 (33%)
Totals	209,967	55,163 (26%)
Source: USDA 2004b BA and USDA 2011e (2010 data)		

In 2004 the potential for disturbance to lynx from timber harvest and prescribed fire activities was predicted to increase above the treatments that occurred in the previous decade. As of 2010, the actual treatment acreage for Decade 1 does not meet the 2004 predictions. Economic difficulties and project-level decisions are the likely causes. Therefore the direct effects to lynx have been lower than predicted in 2004.

Discussion: The risks to lynx from vegetation management are expected to remain low primarily due to the Forest Plan direction to conserve lynx and lynx critical habitat. Because of the large area of the Superior National Forest within the designated lynx critical habitat area, the relatively low population of resident lynx, and varied landscape conditions the potential for, and number of lynx expected to directly impacted by vegetation management practices is expected to be low. Based on Forest Plan direction for lynx project-level planning and implementation, the Forest expects to minimize or eliminate the potential direct effects to lynx and critical habitat.

Indirect Effects:

Indicator 1a: Snowshoe hare habitat

Indicator 1b: Unsuitable habitat (young habitat for snowshoe hare)

Indicator 2: Red squirrel habitat. This indicator is dropped from further use.

Indicator 3: Denning habitat

Indicator 4: Connectivity habitat

LAUs

The data in Table Lynx-17 shows the current condition of prey habitat on a Forest-wide basis along with the range of conditions found in individual LAUs.

Table Lynx-17: Indicators 1a and 1b – Snowshoe hare habitat and unsuitable habitat on NFS lands in LAUs. The range of conditions within individual LAUs from lowest to highest. 2004/2010 total acres (1000s) & total % only.

Decade	Indicator 1a: Snowshoe hare habitat						Indicator 1b: Unsuitable habitat on NFS lands					
	All LAUs (2004)		All LAUs (2010)		Range of amounts		All LAUs (2004)		All LAUs (2010)		Range of amounts	
	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%	Acres (1000s)	%
2010	-	-	789.9	61.6	5.9-24	39-84	-	-	29.6	2.3	0-5.6	0.2-16.3
2004 baseline	666.6	53.6	-	-	-	-	57.3	4.6	-	-	-	-
1	602.6	48.4	-	-	-	-	47.7	3.8	-	-	-	-
2	521.3	41.9	-	-	-	-	48.0	3.9	-	-	-	-
5	373.0	30.0	-	-	-	-	49.2	4.0	-	-	-	-
10	399.9	32.	-	-	-	-	44.7	3.6	-	-	-	-

Source: USDA 2004b BA and USDA 2011e (2010 data)

The information in Table 17 indicates that indirect effects to lynx and habitat have been less in the first 5 years of Decade 1 than that predicted in 2004 with less unsuitable habitat on NFS lands, but with greater acres of snowshoe hare habitat.

Other Critical Habitat Areas: Lynx Habitat outside of LAUs

The data in Table Lynx-18 shows the current (2010) condition of prey habitat along with unsuitable conditions found in individual non-LAU areas.

Table Lynx-18: Indicators 1a and 1b – Snowshoe hare habitat and unsuitable habitat on NFS lands in NLAs.					
NLA	Lynx Habitat Acres	Indicator 1a: Snowshoe hare habitat		Indicator 1b: Unsuitable habitat for snowshoe hare	
		Acres	%	Acres	%
1	7,049	4,592	60	0	0
2	31,376	19,704	60	33	0.1
3	5,948	4,917	65	0	0
4	11,597	7,395	56	365	3
5	11,609	10,494	83	66	0.5
Total	67,579	47,102	70	369	> 1

Source: USDA 2011i (2010 data)

Indicator 1a: Snowshoe hare habitat

Table Lynx-17 shows that six years into Decade 1 by 2010 approximately 789,963 acres or 61.6% of the snowshoe hare habitat exist in LAUs, which exceeds Decade 1 projections. Meeting

Decade 1 unsuitable habitat projections may be problematic due to economic conditions that result in a lower number of implemented timber sales, which provide three or more years of unsuitability depending on forest type. However after snowshoe hare habitat becomes suitable in non-LAU areas an additional 47,102 acres of the snowshoe hare habitat should exist. Unsuitable habitat in non-LAU areas is less than 1 %.

The assumptions in the 2004 BA that hare habitat conditions would have a steady decrease through Decade 10 remain valid, although that the current Forest planning cycle will only apply through Decade 2 estimates. Decreases in young habitat would move conditions toward RNV, but remain well above RNV. Older age classes of suitable hare habitat would move away from Range of Variability (RNV) and provide less old forest than predicted under RNV. The prediction in the 2004 BA that in Decade 10 that habitat would be more than sufficient to provide for healthy hare populations remains valid.

Discussion: The Forest Plan is expected to provide habitat through the planning cycle, and into the future, though timber harvest, prescribed fire, vegetative succession, and occasional natural disturbances such as wildfire and wind storms. In 2004 concerns existed on the juxtapositioning of foraging, denning and connectivity habitat. Forest Plan direction allows for a variable increase in sizes of temporary patches and clear-cut patch sizes, depending forest types (Chapter 2 – pgs. 2-24 through 2-27).

Some foraging habitat within large openings may be less available to lynx for three to five years until forest regeneration provides suitable habitat. There are two measures for large patch temporary openings. The first one is the average temporary opening size and the second one is the number of patches greater than 300 acres. Maximum size limits for harvest areas are evaluated to determine whether such size limits should be continued. With S-TM-2, harvest using even-age regeneration methods may create a temporary forest opening no larger than 1,000 acres in size. O-VG-20 allows for the creation of large patch temporary openings up to 1000 acres...O-VG-21 allows for an increase in the average size of temporary forest openings.

In other non-LAU areas Table Lynx-18 indicates snowshoe hare habitat on NFS lands is available and makes up the majority of the total lynx habitat acres in each non-LAU area in spite of the fragmented ownership patterns in each area. However, projects in these areas could maintain snowshoe hare habitat for lynx over time..

Project-level planning is used to maintain or enhanced hare habitat, and ensure young forest habitat is well distributed across the Forest based on projects implemented since 2004 (USDA 2010h, and 2010i). On USFS lands, depending on the design of individual projects, the distances between foraging habitats within large openings can vary and best addressed at the project-level.

Indicator 1b: Unsuitable habitat

Table Lynx-17 indicates that unsuitable habitat will remain below the 15% threshold (S-WL-1) in all LAUs as an existing (2010) condition. This is in comparison to the data from the 2004 BA that indicates that through the remaining planning cycle (Decades 1 and 2), and in projected decades 5 and 10 will remain below the 15% threshold in all LAUs.

Table Lynx-18 indicates that unsuitable habitat for snowshoe hare is very low or none on NFS lands in all five non-LAU areas. This is well below the 15% threshold on NFS lands as an existing (2010) condition.

Discussion: In 46 of 47 LAUs project-level planning and implementation continues to ensure that unsuitable habitat conditions do not exceed the 15% threshold as per Forest Plan direction (S-WL-1). The one LAU that is currently above the threshold is LAU 44 (16.3%) but this LAU is exempt from S-WL-1 due to its location. However, circumstances may arise where other LAUs may reach the 15% threshold. With the Forest Plan direction emphasis on increasing patch sizes up to 1000 acres to replicate historical forest conditions there is a potential that some LAUs may reach or exceed 15% unsuitable level in the future. Project-level planning and implementation should ensure that unsuitable conditions do not exceed 15% unless there is a demonstrable benefit to lynx, and the US Fish and Wildlife Service concurs with the decision.

The five non-LAU areas are not considered LAUs because of the mixed ownership patterns in each (USDA 2000). Unsuitable habitat for snowshoe hare is very low or none on NFS lands in all five NLAs, and USFS ownership is very fragmented and in the minority in four out of five areas, therefore these non-LAU areas are exempt from G-WL-3.

Indicator 3: Denning habitat

LAUs

As indicated in the 2004 BA, the quantity and distribution of denning habitat would vary over time. Both 2004 and 2010 data indicate that minimum denning habitat needs would be met and be substantially more than required by the Forest Plan (USDA 2004 - G-WL-4), forest-wide. Table Lynx-19 displays both 2010 and 2004 BA data.

Table Lynx-19: Indicator 3: Denning habitat. Acres and percents of denning habitat on NFS lands in LAUs.						
Decade/Year	Forested lynx habitat in LAUs		Total Denning Habitat		Total denning habitat in patches 5 acres or greater	
	Acres	% of NFS land in lynx habitat	Acres	% of NFS lands denning habitat	Acres	% of NFS lands denning habitat
2010	1,148,265	90.5	552,533	43.5	549,507	43.3
2004	1,140,000	91.3	517,212	45.4	514,600	45.1
1	1,137,400	91.1	478,988	32.1	475,300	41.8
2	1,137,500	91.1	434,155	38.2	429,500	37.8
5	1,137,600	91.1	220,336	19.4	216,300	19.0
10	1,137,600	91.1	507,746	44.6	502,000	44.1
Source: USDA 2004b BA and USDA 2011e (2010 data)						

Discussion: This information indicates that lynx denning habitat is abundant and well-distributed in northeastern Minnesota and supports lynx critical habitat on the Superior National Forest. This information indicates that denning habitat does not appear to be a limiting factor in northeastern Minnesota, and at the Forest-planning level. In addition, research supports both past and current estimates. Moen et al. (2008) estimated that about 25% of the landscape in

northeastern Minnesota consists of suitable lynx denning habitat. Table Lynx-19 indicates that the percentage of NFS lands with denning habitat exceeded that estimate in 2004, 2010 and through the remainder of Decades 1 and 2.

Other Critical Lynx Habitat outside of LAUs

The data in Table Lynx-20 shows the current condition of denning habitat along with the range of conditions found in individual non-LAU areas.

Table Lynx-20: Indicator 3: Denning habitat. Acres and percents of denning habitat on NFS lands in NLAs.						
NLA	Forested lynx habitat in NLAs		Total Denning Habitat		Total denning habitat in patches 5 acres or greater	
	Acres	% of NFS land in lynx habitat	Acres	% of NFS lands denning habitat	Acres	% of NFS lands denning habitat
1	7,049	91.7	2,496	32.5	2,480	32.3
2	31,376	96.2	16,292	49.9	16,273	49.9
3	5,948	78.7	3,021	40.0	3,013	39.9
4	11,597	87.6	5,646	42.7	5,624	42.5
5	11,609	91.6	8,043	63.5	7,987	63.0
Source: USDA 2011i (2010 data)						

Discussion: With the US Forest Service being the minority land owner in four out of five non-LAU areas these areas are exempt from Forest Plan direction G-WL-4 (USDA 2004). Because they are not LAUs the other critical habitat areas are exempt from the 10% denning habitat threshold as per Forest Plan direction. However, if available, projects in these areas could maintain or provide large-down wood for denning structure for lynx. Table Lynx-20 indicates that on NFS lands, in these non-LAU areas, that denning habitat is available, and in patches five acres or greater in size.

Indicator 4: Connectivity habitat

LAUs

Habitat conditions in LAUs and lynx movement patterns characterize connectivity. Both upland and lowland northern Minnesota forests typically have dense canopies and multi-storied structure. Only water bodies, roads and recent harvest areas are considered to lack connective cover. Tables Lynx-21 and 22 displays the information from the 2004 BA and 2010 conditions for connectivity habitat in LAUs and non-LAU areas.

Table Lynx-21: Indicator 4 – Acres and percent of connectivity habitat.		
Decade/Year	All LAUs	
	Acres	% of NFS lynx habitat
2010	1,111,436	87.5
2004	1,187,000	95.4
1	1,197,000	96.2
2	1,196,000	96.1

5	1,195,000	96.0
10	1,200,000	96.4
Source: USDA 2004b BA and USDA 2011e (2010 data)		

Discussion: Within NFS lands and designated critical habitat, lynx habitat is fragmented by both natural and human causes. Natural fragmentation is partially due to natural disturbances that may create unsuitable habitat for a few years. In addition, the hundreds of lakes that occur in northeastern Minnesota also fragment habitat. Vegetation management activities make up nearly all the annual human-caused fragmentation in actively managed portions of the National Forest. However, these areas typically re-vegetate within three to five years; with recovery time varying based on the forest type, and number and type of activities. Nevertheless, the quantity and percent of NFS lands that provide connectivity are very high. The Forest Plan does not propose activities that would unacceptably fragment habitat. However, if projects such as large recreational developments or highways or mines are proposed fragmentation would be addressed at the project-level.

The information for LAUs in Table Lynx-21 is supported by recent research (Moen et al. 2010) which indicates that habitat connectivity does not appear to be a factor in northeastern Minnesota. Based on this information, connectivity within designated critical habitat and with Ontario, Canada appears to be excellent. However, the information in Tables Lynx-8 and 20 indicates that habitat connectivity is less certain and varies based on the lower number of acres and overall percentage of NFS lands in the five other critical habitat areas.

Connectivity is less assured due to the extent of mixed ownership, roaded conditions, or developed use in this habitat outside LAUs. However, when compared to the connectivity-levels within the Forest LAU network connectivity is amply provided with more than 87% forested cover across the Superior National Forest.

Other Critical Lynx Habitat outside of LAUs

The data in Table Lynx-22 shows the current condition of connectivity habitat conditions found in individual non-LAU areas.

Table Lynx-22: Indicator 4 – Acres and percent of connectivity habitat.		
NLA	Acres	% of NFS lynx habitat
1	6,939	90
2	31,357	96
3	5,948	79
4	11,231	85
5	11,589	92
Source: USDA 2011i (2010 data)		

Discussion: In Table Lynx-22 the Superior National Forest is primarily a minority land manager. However, connectivity habitat on NFS lands in non-LAU critical habitat areas is available, and makes up a high percentage of NFS lands in these areas (Table Lynx-22). In being a minority landowner in four out of five NLAs, The USFS must rely on other land owners to provide additional connectivity, but this is beyond the jurisdiction and authority of the US Forest Service.

The dense forests of northeastern Minnesota may mitigate for the mixed ownerships due to the dense vegetation that exists.

Connectivity outside the Superior National Forest

Canada lynx are known to roam into other portions of Minnesota that are outside of designated critical habitat (MN DNR 2011b). The information in Tables Lynx-21 is limited to NFS lands managed primarily by the Superior National Forest within the Forest proclamation boundary. Due to land ownership factors secure linkage areas do not exist between the Superior National Forest and the Chippewa National Forest, as well as with northern Wisconsin and the Upper Peninsula of Michigan. This is due to large amounts of private landownership and human-developments between National Forests in the western Great Lakes. However, individual lynx may, and are known to travel long distances outside of northeastern Minnesota into Canada and elsewhere in Minnesota (Moen et al 2008, and MN DNR 2011b).

The Chippewa National Forest has established LAUs but the Forest is outside the USFWS designated critical habitat area. The Forest has five probable and four unverified sightings (MN DNR 2011b, USDA 2011k)). While the Chippewa National Forest has designated LAUs on the majority of the Forest information is insufficient to confirm there is a lynx population on the Forest (USDA 2011k). The closest distance between the Chippewa and Superior National Forests is approximately 50 air miles. MN DNR records (MN DNR 2011b) indicate lynx sightings have occurred between the two Forests..

Lynx have historically occupied, and have recently been sighted in northern Wisconsin and the Upper Peninsula of Michigan (WI DNR 2011, Linden et al 2011). However, the ability of lynx to persist in these adjacent areas is questionable. No resident lynx are known to occur in northern Wisconsin (USDA 2011j). The Chequamegon-Nicolet National Forest has no confirmed lynx sightings but an unconfirmed sighting occurred as late as 2008. In 2000 the Chequamegon-Nicolet National Forest concluded that insufficient lynx habitat existed and did not designate LAUs on that Forest (USDA 2011j).

Linden et al (2011) has modeled habitat potential for Canada lynx in the Upper Peninsula of Michigan. This study results are generally consistent with the USFWS determination that Michigan's Upper Peninsula most likely functions as dispersal habitat.

Human Disturbance /Access – Trails or Roads, and ATV and Snowmobile Policy

Indicator 5: Miles of ATV Trails allowed

Indicator 6: Miles of Snowmobile trails allowed

Indicator 7: Miles of (a) temporary road and (b) Objective Maintenance level (OML) 1 and 2 (low standard) system road planned.

Indicator 8: Policy on cross-country use of ATVs and snowmobiles

Indicator 9: Policy on use of ATVs and snowmobiles on OML 1 and 2 roads

Tables Lynx-23 through Lynx-26 provide information on conditions in the 2004 BA and existing 2010 conditions of Human Disturbance /Access Indicators 5 through 9.

Table Lynx-23: Indicators 5 and 6- Existing and Maximum new designated ATV and Snowmobile trails				
Decade/Year	Indicator 5: ATV Trails		Indicator 6: Snowmobile Trails	
	Designated Miles	Decade 1 max additional miles	Designated Miles	Decade 1 max additional miles
2010	47.1	82.9	705 (1,562 forest-wide)*	130
2004	40	90	686 (1,509 Forest-wide)	130
Source: USDA 2004a FEIS, 2004b BA and USDA 2011e (2010 data)* = see narrative blow				

Discussion: The Forest Plan states we are allowed to construct up to 90 miles of ATV trail in addition to the baseline trail system defined in the Plan. After the Forest Plan was approved the Forest realized that there was an additional 7.2 ATV trails which were not calculated in the mileage during the Forest Plan process (USDA 2010e) show that this constituted 7.1 miles. As of 2010 the Forest has 82.9 miles (90 - 7.1 miles) available for new ATV construction.

An error in the calculating the designated and forest-wide (both NFS and non-NFS) snowmobile trail miles (Indicator 6) was discovered in the 2004 BA. The 2004 BA referenced the FEIS which specified that the...”Forest manages 705 miles of its 1,562 miles outside the BWCAW for snowmobile use” but the values of 686 miles and 1,509 Forest-wide were erroneously entered into the 2004BA (USDA 2004a FEIS 3.8.44, and 2004b BA). To confirm the FEIS numbers GIS data and recreation department records were reviewed. The error was an early estimate that was not corrected in the 2004 final BA. Efforts to track and update route mileage are ongoing and will be reviewed on an annual basis.

The Forest has not constructed any new ATV and snowmobile trails since 2004. Therefore, there is no change in the 130 miles of Decade 1 maximum additional miles of snowmobile trail that can be constructed. Because there has been essentially no change in the ATV and snowmobile trail construction miles effects to lynx are essentially unchanged. Since no additional ATV and snowmobile trails have been constructed there has been no additional fragmentation of lynx critical habitat. Without any new additional ATV and snowmobile trails connectivity should be the same as it existed in 2004. The Forest Plan provides direction to manage ATV and snowmobile use as it changes over time.

In 2009 (USDA 2009) the Forest made a decision to decommission 154 miles and designate 142 miles of unclassified roads to the Forest Service system. Most of these 142 miles are roads not trails. The TMP decision converts 14 miles of unclassified roads to system motorized trail. The Forest Plan provided direction for trails. For example, if the Forest were to construct a new ATV trail it would count toward the 90 miles of Decade 1 maximum additional miles. Also, if the Forest were to close a road and turn it into an ATV trail, it would count toward the 90 miles. If Forest were to construct a road for logging purposes but allow ATV use, it would not count toward the 90 miles of Decade 1 maximum additional miles. However, the decision will create 2.5 miles of new trail to provide linkages. When constructed the 2.5 miles of new trail would apply to the allowed ATV and snowmobile trail system mileage in Table Lynx-23.

Table Lynx-24: Indicator 7 (a) – Estimated miles of temporary roads and Indicator 7 (b) – Miles of OML 1 and 2 System Roads. 2004 data and Estimates and actual roads numbers and Decade 1 percentages by 2010.			
Decade/Year	Temporary Roads	OML 1 Roads	OML 2 Roads
	miles	miles	miles
2010	158 (21%)	948 (84%)	979 (113%)
2004	432	883	867
Decade 1	754	1132	867
Decade 2	764	1334	867
Decade 3	761	1485	867
Decade 10	764	2022	867
Source: USDA 2004a FEIS Appendix F-21, USDA 2004b BA and USDA 2011e (2010 data)			

Discussion: Data from FY05 to FY10 (2010) amounts of timber sales sold indicate that the quantity and percentage of estimated temporary and OML 1 roads are below 2004 Decade 1 estimates. This information indicates that indirect effects to lynx and habitat from these types of roads have been less in the first 6 years of Decade 1 than that predicted in 2004. As of 2010 OML 2 roads are 13% above both Decade 1 and subsequent Decades 2, 3 and 10 predictions.

Temporary and OML 1 roads are decommissioned or closed with custodial care after vegetation management projects are completed therefore effects to lynx and critical habitat are eliminated or minimized. However, OML 2 roads may require mitigation since they are built to a standard that accommodates high clearance vehicles. The effects of OML 2 roads on lynx and lynx critical habitat and mitigation measures are addressed at the project-level, but increased mileage may increase the risk to lynx without additional mitigation.

Table Lynx-25: Indicator 8 – Cross-country ATV and Snowmobile Policies		
Forest Emphasis	Policy	Need for Change
ATV Cross-country	Prohibited	No
Snowmobile Cross Country	Allowed*	No
Source: See Forest Plan Chapter 3 for exceptions by Management Area		

Discussion: No change has occurred regarding cross-country ATV and snowmobile policies.

Table Lynx-26: Indicator 9 – Potential for ATV use on existing OML 1 and 2, and unclassified roads.		
Forest emphasis	2004	2010
OML 1 and 2 roads	Allowed	Allowed*
Unclassified roads	Allowed	Allowed*
Source: USDA 2004b - 2004 BA and 2010 data. *When the TMP is implemented, ATV use will be allowed only on those routes displayed as open to ATV on the Motor Vehicle Use Map		

Discussion: No change has occurred regarding ATV use on existing OML 1 and 2 and unclassified roads policies. However, when the TMP is implemented, ATV use will be allowed only on those routes displayed as open to ATV on the Motor Vehicle Use Map.

Direct Effects

The LCAS (2000) indicates that increasing human use of National Forests and human developments in lynx habitat (denning and foraging) both adjacent to and in mixed-ownership areas can increase the potential for impacts to lynx and the species recovery. The LCAS indicated that indirect effects were a potential higher risk than direct impacts. However, the LCAS and National BA did not identify human disturbance and access from trails or roads, and ATV and snowmobile policy as risk factors to lynx in the Great Lakes geographic area. At a National Forest-scale these factors would have a very low risk due to the random nature of human encounters with lynx. The Forest Plan provides direction to protect denning sites and manage lynx habitat (**3.6.2.1 Resource Protection Methods**).

Since 2004 lynx reproduction has been confirmed and denning sites have been located on the Forest (Moen 2008). However, no known lynx denning sites have been affected by project-level activities.

Discussion: In the 2004 BA it was stated that through the first decade of Forest Plan implementation and over a longer term, road and trail construction could cumulatively become a measureable risk. The 2010 the data in Tables Lynx-23 through Lynx-26 indicate that in most categories land management activities and subsequent road or trail development have been less in the first 6 years of Decade 1 than predicted in 2004, except for OML 2 roads miles (Table Lynx-24). The information in Table Lynx-24 indicates that OML 2 road miles are greater in 2010 than predicted in 2004. In the first 6 years of Decade 1 OML 2 roads have increased at a rate of approximately 19 miles per year to approximately 979 miles in 2010. At this rate an additional 76 miles could accrue in the remaining four years of Decade 1 for a potential total of 1,055 miles. Predictions made in the 2004 BA appear to have underestimated OML 2 mileage for Decade 1, therefore predictions for Decades 2, 3 and 10 may also be underestimated (USDA 2004a – Final EIS and USDA 2004b BA).

The miles of low-standard OML 2 roads open at one time are intended to support (e.g. roads into timber sales depending on management projects or activities. Also, some unclassified roads may have been added to the road system as OML 2 roads by the TMP because these were determined to be needed for management or access, although no physical change is created by such designation. Therefore, the increased cumulative mileage since 2004 is now being accounted for in this biological assessment.

Forest and project-level mitigation measures may be needed to mitigate for the higher number of OML 2 roads that have been constructed during the first 6 years of Decade 1. In Decade 2 and the next planning period, newly constructed OML 2 roads would generally not be added to the road system through project planning and implementation.

While lynx mortality on Forest roads appear to be small (USDI 2010) the increase in OML 2 roads could result in indirect effects to lynx denning and critical habitat by increasing the risk of lynx mortality due to increased human access on OML 2 roads. However, according to the USFWS lynx incidental mortality database (USDI 2010) there currently does not appear to be any

related increase in lynx mortality on USFS managed roads within the Forest proclamation boundary.

The lower-than-predicted miles of temporary and OML 1 roads indicate that the potential for direct effects to lynx from project-level road development may remain low. This is due to the lower than predicted amounts of land management activities during Decade 1, the high levels of connectivity due to dense forested habitat conditions, and relatively low levels of lynx mortality attributable to Forest roads. Since the 2004 BA was written (USDA 2004 - Forest Plan and USDA 2004b -BA) four additional lynx mortalities have occurred on roads (USDI 2010). However, only one of these mortalities occurred within the Forest proclamation boundary on a USFS managed road. Two other mortalities occurred well off NFS lands on federally-administered highways (USDI 2010).

As indicated in the 2004 BA, the potential for direct effects to lynx and critical habitat may remain low because:

1. The large area of the Superior National Forest within the designated lynx critical habitat area, the relatively low population of resident lynx, and dispersal of projects (USDA 2010I) make the risk of impacting lynx denning and critical habitat from project-level road and trail construction to be very low.
2. In the event that lynx denning is likely (based on habitat or predictions from monitoring efforts) or a den site is located Forest Plan protective measures and other identified mitigation measures would be implemented through project-level planning and implementation.
3. Due to the relatively low population of resident lynx the risk that lynx may be subjected to added stress, displacement, mortality, or other harm is likely to be low.
4. Stress to resident lynx from any undetermined displacement or disruption of habitat use patterns is expected to be temporary.

The Forest will work with the US Fish and Wildlife Service to reduce the risk of disturbance, harm, or mortality to lynx, and impacts to critical habitat from this increased amount of OML 2 roads during the remainder of Decade 1, and the remainder of the planning cycle.

Indirect Effects

The two key concerns, described in the 2004 BA, with potential indirect effects from the management of roads, trails, and cross-country travel remain valid for lynx and critical habitat (see Sections 3.5.4.3 and 3.5.5).

1. The potential for increased miles and distribution of snow-compacted routes and increased access for competitors to lynx habitat.

2. The potential for increased disturbance to lynx from increased human access into lynx habitat; in particular the potential for lynx mortalities due to incidental trapping.

Management direction in the Forest Plan has been designed to avoid or reduce adverse impacts to lynx from designated trails, classified roads, unclassified and temporary roads, undesigned or user-developed trails (**Section 3.6.2.1 - Resource Protection Methods**).

The indicators for Human Disturbance/Access are evaluated below. A summary section is included to address the complex interactions of all the indicators in order to assess the likelihood and risk of impacts to lynx.

Indicator 5: Miles of ATV Trails allowed

Indicator 6: Miles of Snowmobile trails allowed

Table Lynx-23 provides existing (2010) and past (2004) miles of designated ATV and snowmobile trails on NFS and non-NFS lands within the Superior NF boundary. Table Lynx-23 also provides the miles of existing and maximum new designated ATV and snowmobile trails allowed. Also, the Forest Plan Final EIS Chapter 3.8.3 and Appendix F provide RMV trail information and analysis (USDA 2004a).

Discussion: In 2004 the Forest Plan proposed increases to the designated ATV and snowmobile trail system. Table Lynx-23 indicates that there has been no new construction of these designated trails. However, in 2009 the Forest added 142 miles of existing unclassified roads to the Forest Service system while decommissioning 154 miles of unclassified roads. This decision reduced the total mileage of roads open to motorized vehicles on the Superior National Forest by approximately 108 miles, but created 2.5 miles of new trail to provide linkages. Once constructed the 2.5 miles of new trail would apply to the allowed ATV and snowmobile trail system mileage in Table Lynx-23.

In the event that additional new designated ATV and snowmobile trails are proposed the construction and management of new system trails Resource Protection Methods (**Section 3.6.2.1**) would be applied to avoid or reduce adverse impacts to lynx recovery and critical habitat.

Any proposed new construction of snowmobiles and/or ATV trails would be assessed to determine if there is a potential for increased and/or deeper human access in lynx critical habitat. As in the 2004 BA, increased human access could result in trapping, hunting or other recreational activities that may increase the risk of disturbance, harm, or mortality to lynx in previously inaccessible areas of the Forest.

Because of the vulnerability of lynx to trapping, incidental deaths could occur and would be difficult, if not impossible, to avoid since non-federally listed furbearers (i.e. marten and fishers, etc.) occur in similar habitats as lynx, and the state of Minnesota manages and permits the trapping of furbearers as well as predators such as coyote. However, to date documented incidental lynx deaths on USFS managed roads within the Forest proclamation boundary have been low (USDI 2010).

The Forest Plan direction to provide recreational uses on the Forest creates a potential for adverse impacts to lynx and critical habitat. Forest Plan direction G-WL-8 provides guidance for road and trail density in LAU lynx (now critical) habitat. This direction recommends an upper limit road and trail density of two (2) miles per square mile, and to seek opportunities to reduce route density. In addition, Forest direction S-WL-2, generally allows for no net increase of winter trails unless travel use is consolidated.

An example of the use of this direction is the Forest development and implementation of the Travel Management Plan that intends to manage travel use across the Forest. The 2009 Plan would limit impacts to lynx by designating routes and reduce the potential for additional snow-compacting routes by decommissioning un-needed roads. The Forest added 142 miles of existing unclassified roads to the Forest Service system while decommissioning 154 miles of unclassified roads. This allowed for no net increase of winter trails and travel use was consolidated on previously unclassified roads.

By designating routes in the Travel Management Plan the Forest is managing ATV trails that could see un-authorized snowmobile use that would compact snow. If the Forest is successful in preventing unauthorized snowmobile use on designated ATV trails the risk to lynx would be reduced. The co-designation of ATV and snowmobile trails may further consolidate use and the potential for snow compaction. The effectiveness of travel management would be through Forest Plan monitoring of the road and trail network and use.

In conclusion, indirect effects to lynx and critical habitat would be the same as direct effects for Indicators 5 and 6.

Indicator 7: Miles of (a) temporary road and (b) Objective Maintenance level (OML) 1 and 2 (low standard) system road planned.

Information on the current and 2004 conditions for temporary and OML 1 and 2 roads is in Table Lynx-24. Also refer to Forest Plan Appendix F for road information, analysis and definitions used in 2004.

The Superior National Forest Plan proposed:

1. A substantial increase in new construction of temporary roads in all Decades.
2. A moderate increase in OML1 roads in all decades.
3. No change in OML 2 road miles.

Discussion: As discussed in this section under Direct Effects it was stated that through the first decade of Forest Plan implementation and over a longer term, road and trail construction could cumulatively become a measureable risk. The data in Tables Lynx-17 and 24 of this BA indicate that in most categories land management activities and subsequent road or trail development have been less in the first 6 years of Decade 1 than predicted in 2004, except for OML 2 roads miles. The information in Table Lynx-24 indicates that OML 2 road miles are greater in 2010 than predicted in 2004.

In the first 6 years of Decade 1 OML 2 roads have increased at a rate of approximately 19 miles per year to approximately 979 miles in 2010. At this rate an additional 76 miles could accrue in the remaining four years of Decade 1 for a potential total of 1,055 miles. Predictions made in the 2004 BA appear to have underestimated OML 2 mileage for Decade 1, therefore predictions for Decades 2, 3 and 10 may also be underestimated (USDA 2004a – Final EIS and USDA 2004b BA).

The miles of low-standard OML 2 roads open at one time depend on the management projects/activities that they are intended to support (e.g. roads into timber sales. Additional forest/project-level mitigation measures may be needed to mitigate for the higher number of OML 2 roads that have been constructed during the first 6 years of Decade 1. In Decade 2 and the next planning period, newly constructed OML2 roads would generally not be added to the road system with better project planning and implementation.

Project-level analysis would ensure that lynx conservation is considered and that no net increase of snow-compacted trails is allowed. Forest Plan monitoring of the road network and post-project use would determine the effectiveness of temporary, and OML 1 and 2 road management.

In conclusion, indirect effects to lynx and critical habitat would be the same as the direct effects for Indicator 7.

Indicator 8: Policy on cross-country use of ATVs and snowmobiles

Table Lynx-25 provides information on Forest cross-country ATV and snowmobile policies. Also, refer to the Forest Plan Final EIS Chapter 3.8.3 for further analysis on ATV and snowmobile cross-country use.

Discussion: No change has occurred regarding cross-country ATV and snowmobile policies. The potential for cross-country use of ATVs and snowmobiles is very rare and limited due to the very densely forested environment on the Forest. Therefore, there may be little or no change for impacts to lynx and critical habitat.

Forest Plan monitoring of the road network and post-project road use would determine the effectiveness of travel management policy and closure effectiveness (USDA 2009a). In conclusion, indirect effects to lynx and critical habitat would be the same as direct effects for Indicator 8.

Indicator 9: Policy on use of ATVs and snowmobiles on OML 1 and 2 roads.

Table Lynx-26 provides information on Forest ATV and snowmobile use policies. Also, refer to the Forest Plan Final EIS Chapter 3.8.3 for further information and analysis on RMV policy.

Discussion: No policy change has occurred regarding ATV and snowmobile use on OML 1 and 2 roads. ATV use continues to be allowed on all existing OML 1 and 2 roads, and unclassified roads, with the exception that use is prohibited in some Management Areas (USDA 2004 – Final FEIS Table RMV-4) which makes up approximately 39% of the entire Forest and 2% of the

Forest outside the BWCAW. Project-level would assess the need for ATV travel on OML-1 and unclassified roads (USDA 2004b – G-RMV-4). Therefore, there may be little or no change for impacts to lynx and critical habitat.

Forest Plan monitoring of the road network and post-project road use would determine the effectiveness of travel management policy and closure effectiveness (USDA 2009a). In conclusion, indirect effects to lynx and critical habitat would be the same as direct effects for Indicator 9.

When the TMP may be implemented, ATV use would be allowed only on those routes shown on the Motor Vehicle Use Map. All routes not marked open to ATV use on the Motor Vehicle Use Map would be unauthorized for ATV use. The total mileage of routes open to ATV use after the TMP decision may be implemented is similar to the existing situation (USDA 2009).

Summary of the Effects from all Roads and Trails.

The analysis uses the best information available to assess the current and potential conditions on the Forest. It is difficult to identify and assess every potential impact that could occur from motorized and non-motorized human access on the Forest. Management direction varies by use type and users, as well as the types of vehicles that humans use to access National Forest Lands. The Forest Plan predicts that future road development practices forest-wide include the construction of 82 miles of OML-1 roads for summer use and 167 miles of OML-1 roads for winter use over the next several years.

The Forest is continuing inventory efforts, and prioritization of roads for seasonal restrictions or reclamation, and human access management. The Forest continues to improve and refine the analysis of roads and trails to calculate road and trail density on NFS lands. Over time these road and trail numbers are expected to change due to new closures and refined analysis methods.

The direct and indirect effects of human use on road and trails to lynx and critical habitat continue to pose a potential negative impact. This is primarily due to indirect effects of winter snow compaction, and the potential risk of mortality or harm from incidental trapping or illegal shooting.

The Forest provides direction to minimize or eliminate the potential for human/lynx conflict that could result in lynx mortality, and manages habitat for lynx conservation. The state of Minnesota has removed the species as a hunted or trapped species but incidental mortality still occurs in northeastern Minnesota, albeit at relatively low levels as indicated by the USFWS incidental database (USDI 2010).

Project-level planning, analysis and implementation should be able to reduce potential negative impacts and promote lynx recovery.

3.6.4 – Cumulative Effects

The incremental effects of past federal and non-federal actions on lynx are reflected in the existing condition. Past land management activities on all ownerships have shaped the habitat that

exists today for lynx on the Forest. The Forest Plan predicts that additional impacts would occur on lands outside of National Forest jurisdiction. When these impacts are considered in combination with proposed actions of this project, cumulative effects could occur. Past, present and reasonably foreseeable future actions (2004-2014) are considered in this analysis. Past, ongoing and future Forest projects that affect lynx habitat are consulted on separately and have or will receive determinations of effect on a project-by-project basis. A list of potential foreseeable future federal and non-federal actions considered in the analysis area is listed in Appendix A. Key ongoing or foreseeable future federal actions on the Forest that have the potential for affecting lynx habitat are summarized below. Consultations for these projects are separate from this BA.

11. Federal Hardrock Mineral Prospecting Permits EIS (in draft)
12. PolyMet Mining, Inc.- North Met Project. Proposed hardrock mine and land exchange. EIS (ongoing).
13. Twins EA – Gunflint Ranger District. Vegetation management project.
14. Tracks Project EIS - Laurentian Ranger District (2010). Vegetation management project.
15. Toohey Project EA – Tofte Ranger District (2011). Vegetation management project.
16. Birch Project EA – Kawishiwi Ranger District (2011). Vegetation management project.
17. Travel Management Project EA - Forest-wide (2009; under litigation). Transportation actions that do not include construction of new roadways.
18. South Fowl Lake Snowmobile Access Project EIS – Gunflint Ranger District.
19. Tomahawk Trail Victor Lake By-pass EA – Tofte Ranger District (on hold)
20. Other Activities on Other Ownerships

Determining impacts to lynx and critical habitat at this time for some other foreseeable future federal and non-federal (Appendix A) actions are problematic based on the lack of site-specific information that hasn't been developed. Determining impacts to lynx and critical habitat effects will be completed at the project-level when analyses are completed, but can be discussed in general terms at this time. Past, present and future federal and non-federal actions are addressed in the following narratives.

Minerals Management Projects

Drilling for mineral exploration is most likely to cause cumulative impacts for lynx. Temporary road construction and drilling would cause possible effects which could displace lynx from habitat near drill sites, and would contribute to cumulative temporary road densities which could increase human/lynx conflicts due to increased human access during the time that roads are used. Vegetation clearing at drill sites could provide snowshoe hare habitat after drilling activities cease and the sites begin to revegetate.

Land exchanges in proposed mining sites could have mixed impacts such as a loss of lynx habitat in the proposed mining sites, but a gain of habitat in others areas that are currently in other ownerships. This could lead to a consolidation of lynx habitat where the US Forest Service would gain ownership. Habitat lost by large-scale mining operations would be an irreversible or irretrievable impact to lynx due to the large-scale changes in landscape character at the mining sites.

Vegetation Management Projects

Vegetation management projects are proposed to manage the vegetation and road system in project analysis areas towards the desired conditions stated in the Forest Plan. Forest management intends to improve stand diversity through harvest to restore desired forest conditions, and reduce hazardous fuels through site preparation and prescribed burning. Temporary roads could be used for access. These activities would affect foraging conditions for snowshoe hare and potentially impact lynx denning habitat. Temporary road construction could increase human/lynx conflicts by providing human access during the time that roads are used.

Roads Projects

Proposed vegetative management projects will require logging roads to achieve resource management objectives. Federal and/or state highway work across NFS lands requires an assessment of potential effects to wildlife species to identify potential mitigative measures. Other transportation actions do not include construction of new roadways but the decommissioning of existing roads to manage and consolidate human use and access. The Forest Plan predicts that future road development practices forest-wide include the construction of 82 miles of OML-1 roads for summer use and 167 miles of OML-1 roads for winter use over the next several years.

Recreation Projects

Both the South Fowl Lake Snowmobile Access Project EIS and Tomahawk Trail Victor Lake Bypass EA would provide public access on NFS lands to recreation sites or private property (respectively). Both projects are incomplete, but could impact lynx and habitat depending on final project decisions.

Forest Plan direction would be applied to minimize or eliminate potential adverse effects. The Forest Plan allows up to 90 miles of new ATV trails and 130 miles of new snowmobile trails may be designated in Decade 1 (USDA 2004). Table Lynx-18 displays the amounts of ATV and Snowmobile trails measured by Indicators 5 and 6.

Activities in Other Ownerships: Lynx Habitat within and outside of LAUs

Within the proclamation boundary, there are other lands that are not National Forest. These lands of other ownership may be owned by private individuals, industrial and commercial groups, the state of Minnesota, county and local government, or other federal agencies but all the lands are referred to in this biological assessment as “private lands” or “lands of other ownership.”

In non-LAU areas other land owners and managers are outside the jurisdiction and authority of the Forest Service. For USFS projects in these areas a more detailed analysis may be warranted as the Forest Service considers the existing habitat conditions and cumulative actions on all ownerships within these non-LAU critical habitat areas.

Activities on these private, state, county or other federal lands that may influence lynx habitat include mining, quarries, mineral exploration, mineral processing plants, timber harvesting, and recreational activities (including motorized and non-motorized uses). Within LAUs road and compacted trail density on all ownerships is factored in to LAU and non-LAU area analysis to maintain desired conditions outlined in the Forest Plan.

State of Minnesota land for the North Shore and Border Lakes Subsections show that there are access needs for resource management, but these are almost all ‘resource management access routes’ and ‘temporary access routes’ that are closed to motorized use by the public. Roads built on county forest lands may be accessible to the public, but roads on private land for resource management projects would likely not be accessible to the public.

Cumulative Effects Analysis

Since 2004 the Forest has used Lynx Analysis Indicators to measure changes and effects of management activities on lynx habitat. The Forest Plan FEIS and 2004 BA estimated lynx forest habitat conditions that would provide sufficient snowshoe hare, connectivity, denning and unsuitable habitat for the Northern Superior Uplands (NSU) Landscape Ecosystem for the Superior NF using data described by the Minnesota Resources Forest Council (USDA 2004 - FEIS Volume 1, page 3.3.4-16, USDA 2004b – Table Lynx-17, page 157, and Host et al. 2001).

The Forest has not used this type of data for lynx analysis since the Forest Plan was signed, and this process is no longer repeatable. At the time this was a snapshot of available data, but is no longer useful. The Forest has focused on the standard LAU analysis process used in the 2004 BA, and subsequently for projects since 2004, and the USFWS has not required the Forest to use the NSU Landscape Ecosystem as a unit of lynx analysis. In addition, Tables WTE-16 (USDA 2004 - FEIS Vol. 1 page 3.3.4-17), and Lynx-17, page 157 (USDA 2004 and USDA 2004b) were in error due to the transposing of the denning and unsuitable habitat labels over each of the respective data columns.

For this BA the standard Lynx Analysis Indicators that have been used in describing project-level cumulative effects are used for cumulative effects analysis. Cumulative effects are assessed and estimated in a worst-case scenario.

Cumulative Effects Analysis Area

The cumulative effects analysis area is the Superior National Forest Planning area within the proclamation boundary. Cumulative effects analyses consider known activities on all ownerships and roads within the proclamation boundary that may impact lynx and critical habitat. This is an appropriate analysis area because this is where direct and indirect effects affecting lynx critical habitat would occur, thus allowing for an analysis of the potential compounding effects of those activities with other activities planned or already occurring in the area regardless of ownership. This cumulative effects analysis area was selected because the Forest Plan used the same area. Known and foreseeable activities are listed in Appendix A.

Cumulative Effects Indicators

There are six Lynx Analysis Indicators that are useful in describing cumulative effects. Four of these Indicators, 10-13, have been used in project-level cumulative effects analyses on the Forest. Indicator 14 – Connectivity is a new 2010 addition. Indicator 7: Miles of (a) temporary road and (b) Objective Maintenance level (OML) 1 and 2 (low standard) system road planned, is used again to assess the potential cumulative impacts of the proposed Hard Rock Prospecting EIS as a reasonably foreseeable future project.

These indicators crosswalk with the Critical Habitat PCEs, listed in **Section 3.5.7**, of this BA. The most relevant Forest Plan guidance is noted in parentheses for each indicator.

1. Indicator 7: Miles of (a) temporary road and (b) Objective Maintenance level (OML) 1 and 2 (low standard) system road planned. (PCE b) (O-WL-4-6, S-WL-2).
2. Indicator 10: Acres of snowshoe hare habitat in which within-stand structure will be increased thru diversity and under-planting of conifer on SNF lands (PCE a) (O-WL-4-5).
3. Indicator 11: Acres and % of lynx habitat currently unsuitable on all ownerships (PCEs a, c & d) (G-WL-3).
4. Indicator 12: Cumulative change to unsuitable condition on NFS lands. (PCEs a, c & d) (S-WL-1)
5. Indicator 13: Road and compacted trail density on all ownerships (PCE b) (G-WL-8).
6. Indicator 14: Connectivity (PCEs b & d) (D-LA-1, O-LA-1, and G-LA-1)

Lynx Critical Habitat – Forest Conditions

Indicator 10: Acres of snowshoe hare habitat in which within-stand structure will be increased through diversity and under-planting of conifer on SNF lands.

Indicator 10 provides a measure of O-WL-4 and 5 which states:

1. **O-WL-4:** Maintain, protect, or improve habitat for all threatened and endangered species by emphasizing and working towards the objectives of federal recovery plans and management direction in Forest Plans.
2. **O-WL-5:** Seek opportunities to benefit threatened and endangered species from the spectrum of management activities on NFS land.

Discussion: Between FY05 to FY10, approximately 13,253 acres of diversity and under-planting has occurred on the Forest in which within-stand structure has improved snowshoe hare habitat. Based on the average yearly accomplishments it is estimated that an additional 8,835 acres could be accomplished within the remainder of Decade 1 (FY11-14). However, accomplishments may be affected by recent economic conditions that have limited timber harvest projects that result in reforestation plantings (USDA 2011).

Indicator 11: Acres and % of lynx habitat currently unsuitable on all ownerships

Indicator 11 (Table Lynx-27) provides a measure of O-WL-3 which states “limit disturbance within each LAU on NFS lands as follows: “if more than 30% of the total lynx habitat (all ownerships) within an LAU is currently in unsuitable condition, no further reduction of suitable condition should occur as a result of vegetation management activities by National Forest”.

Table Lynx-27: Indicator 11 – Acres and % of lynx habitat currently unsuitable on all ownerships						
Forest-wide LAUs	Total Lynx habitat on all ownerships		Currently unsuitable habitat on all ownerships		Remaining Decade 1 estimates	
Acres	Acres	%	Acres	%	Acres	%
2,017,972	1,890,149	93.6	47,845	2.4	61,673	3.0
Source: USDA 2011e (2010 data)						

Discussion: The 2010 data indicates that unsuitable conditions are within the G-WL-3 threshold for the foreseeable future. More than 97.5% of lynx habitat would remain suitable across all ownerships.

Timber harvesting will take place on state and county forest lands and private lands at undetermined levels within the National Forest proclamation boundary. State and county timber management programs are typically more intensive than Forest Service programs. However, state programs must follow Minnesota Forest Resources Council assessments and plans, state threatened and endangered species recommendations for lynx, and state forest management guidelines (MN DNR 2010, 2011, and 2011a). Some state timber management projects have been and will continue to be integrated with USFS management in some areas. St. Louis and Lake County timber management programs have plans that address wildlife management needs (St. Louis County 2011 and Lake County 2011). Private landowners that choose to use state best management practices (BMPs) may minimize impacts to wildlife although these BMPs are voluntary.

The amount of habitat on federal lands should offset any short-term loss in habitat on nonfederal lands, and therefore will have to remain below the G-WL-3 threshold since federal lands make up a large percentage of each LAU. Timber harvesting could benefit lynx by creating habitat for prey species after approximately four years depending on forest cover types.

Indicator 12: Cumulative change to unsuitable condition on NFS lands.

Timber harvesting can benefit lynx by creating habitat for prey species. Indicator 12 (Table Lynx-28) provides a measure of S-WL-1 which states that management activities on NFS lands shall not change more than 15% of lynx habitat on NFS lands within an LAU to an unsuitable condition within a 10-year period. This indicator measures the cumulative change of lynx habitat within a decade such that, for example, a stand set to zero at Year 0 is counted toward this indicator until Year 0 + 10, regardless if the stand becomes suitable for lynx prior to Year 0 + 10. The baseline for each LAU was set to zero at the time of plan implementation (July 2004).

Table Lynx-28: Indicator 12 - Cumulative change to unsuitable condition on NFS lands.						
Forest-Wide LAU Conditions	2004 *		2010 Existing		2014 First Decade	
	Acres	%	Acres	%	Acres	%
	57,300	4.6	40,655	3.1	88,515	6.9
Data source: * SNF 2004 LAU analysis and planning record. Superior NF lynx model results for latest existing condition (2010) data.						

Discussion: Adverse cumulative effects are not expected from vegetation management activities in LAUs across the Forest. Between Fiscal Years (FY) 2005 to 2010 (FY05-FY10), approximately 20,741 acres of timber harvest has occurred on the Forest in which habitat has been changed. This reflects an average of 3,457 acres/yr of implementation, resulting in a forest-wide unsuitable condition of 40,655 acres or 3.1% of lynx habitat on NFS lands (USDA 2011e). This reflects a lower than predicted amount of timber harvest than was estimated in 2004.

The 2010 data indicates that forest-wide unsuitable conditions are with the S-WL-1 threshold. More than 96% of lynx habitat remains suitable on NFS lands within the Decade 1 period. LAU SNF44 is above the 15% threshold. This LAU is exempt from Forest Plan direction S-WL-1 due its location and long narrow shape on the Gunflint Trail (USDA 2011e). This LAU is above the threshold in large part due to the Cavity Lake Fire was a large wildfire that burned in the LAU area after the 2004 BA (USDA 2011i).

By analysis year 2014 it is predicted that approximately 88,515 acres of suitable USFS habitat could be in an unsuitable age class, or 6.9%. Forest-wide unsuitable conditions would be with the S-WL-1 threshold. More than 93% of lynx habitat would remain suitable on NFS lands within the Decade 1 period (USDA 2011e). However, three LAUs would be above the 15% threshold in 2014. The LAU SNF44 is stated above. LAU SNF2 would be slightly above (15.1%) the threshold, and LAU SNF9 is predicted be at 17.3% (USDA 2011e).

LAU SNF2 is on the LaCroix Ranger District and contains the Border Project. When consultation was completed on that project the expected result was 14.6% (USDA 2011h). The actual number after the Border Project is implemented will likely be closer to 14.6% due to the acres being dropped from the project. LAU SNF9 is on the Kawishiwi Ranger District and contains the Birch Project. NEPA analysis is ongoing on that project (USDA 2011i).

This BA does not replace the project-level consultations need in these LAUs. More specific analysis and separate consultations, pursuant to Section 7 of the ESA, would occur at the project-level by the ranger districts for actions planned in LAUs SNF2 and SNF9. Project-level consultations will address the areas where the 15% threshold may be exceeded.

The 2014 data reflects the potential amount of habitat that could be changed within Decade 1 (2004-2014) based on existing decisions that have been implemented by 2010, decisions not implemented due to the recent economic downturn, and on-going and planned projects that do not have decisions but are expected to by 2014. The difference in acres between 2010 and 2014 exceeds the 3,457 acres/yr that have changed during the 2005 to 2010 time period. The amount of timber harvest that is actually accomplished during the remaining four years of Decade 1 may still be affected by the downturn in economic conditions.

Denning and foraging habitat would continue to be adequately distributed throughout the Forest. Based on Forest-wide efforts to manage lynx habitat cumulative effects to lynx and critical habitat are expected to be low for the foreseeable future.

Human Disturbance/Access

Indicator 7: Miles of (a) temporary road and (b) Objective Maintenance level (OML) 1 and 2 (low standard) system road planned.

This indicator is used again as a measure of potential change in human disturbance and harm to lynx resulting from the Federal Hard Rock Mineral Prospecting Permits EIS. Because this project is reasonably foreseeable to occur, the potential direct, indirect and cumulative effects to lynx and critical habitat are discussed here.

The Federal Hard Rock Mineral Prospecting Permits Draft EIS (USDA 2011) is expected result in temporary roads being constructed over the next 20 years for minerals prospecting (drilling). The information is summarized in Table Lynx-29, from the EIS analysis, for the current and potential 20-year conditions for temporary roads only for determining cumulative effects to critical habitat. There will be no change in the miles of other types of roads such as OML 1 or 2, therefore OML 1 and 2 roads are not a factor with this project.

Table Lynx-29: Indicator 7 - Miles of Temporary Road Expected Over the Next Twenty Years			
	Data Analyzed	Miles	Percent of Forest Plan FEIS
Expected Condition	Forest Plan FEIS*	898-937	100%
Alternative 1 Existing Condition	2009 M&E Report **	523-628	58% - 67%
Alternatives 2-5	Current Permits and Plans plus 2009 M&E Report**	523-761	58% - 84%
	Future Permits and Plans plus 2009 M&E Report**	532-714	59% - 79%
	Sum of Hardrock DEIS (Current and Future Permits and Plans) and 2009 M&E Report **	532-860	59% - 95%
*Includes planned road decommissioning, temporary, and temporary, and temporary special use permit roads. **Includes planned and completed road decommissioning, temporary, and temporary special use permit roads. Data is from (USDA 2011 - Hardrock Prospecting EIS project file: Road-habitat analysis, temp road effects tab), USDA 2009a, USDA 2004a.			

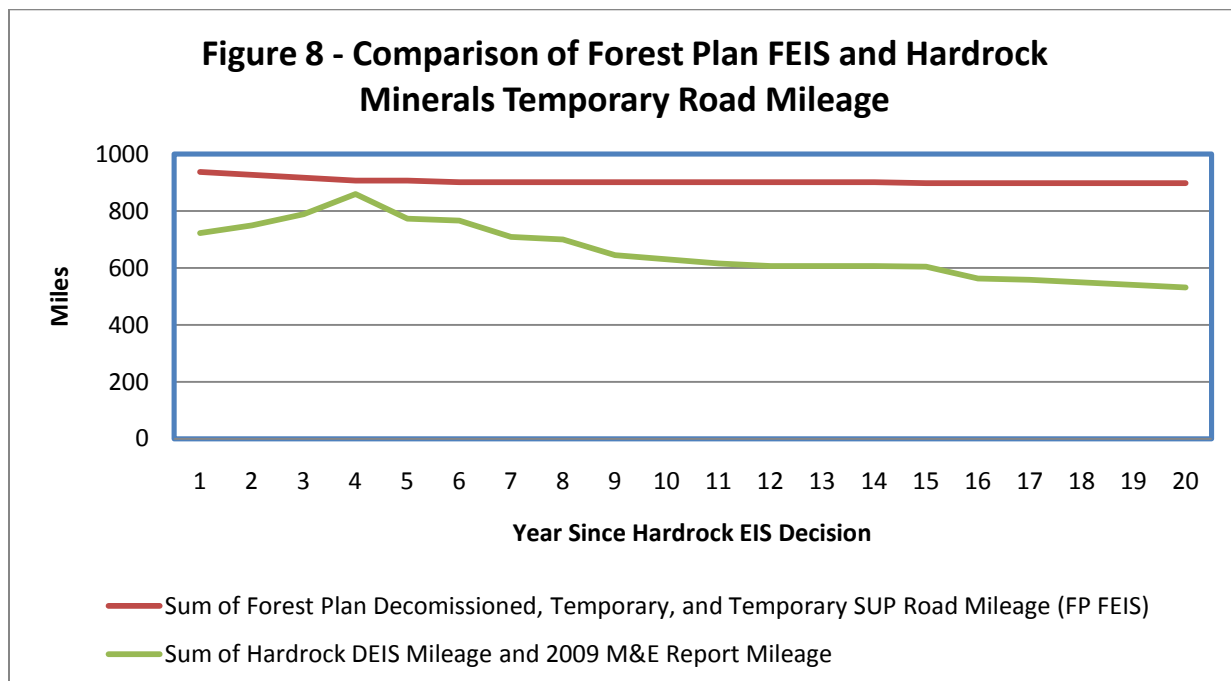
Discussion: Additional temporary road mileage created under the current applications is estimated to range from no miles to 157 miles in any year depending on the year. Depending on the decision for this project a range of 523 to 761 miles could exist when added to the existing condition (**Table Lynx-29: see Current Permits and Plans and 2009 M&E Report**). This would be a range of 58 percent to 84 percent of the Forest Plan FEIS estimated mileage over the life of the project (USDA 2011).

Direct impacts of temporary roads and drill sites would be similar to those roads and landings used in timber sales when constructed (vegetation clearing). Drill sites are expected to have a small footprint on the landscape where they may occur, and temporary roads could vary in length. If these sites left accessible to public use then the risk of human/lynx conflict would increase. The closure of these temporary roads and sites to easy access could reduce the risk of conflict. The intersections of new, closed temporary roads and roads open to the public are likely to become available as parking areas for 2-4 cars. This may lead to an indirect increase in public access to the lands around drill pads and may increase hunting or human disturbance of wildlife in the area (USDA 2011).

Cumulative effects from temporary roads in the Hard Rock Prospecting EIS project are expected to be greater than from other temporary roads because they may stay open for more years (1 to 15 years) than those predicted by the Forest Plan FEIS for resource management such as timber harvest (1 to 5 years). Maintenance of road closures will be the key to reducing effects to lynx. If road closures do not occur or if they are not properly maintained, lynx mortality, or incidental take, may be expected because of increased human access (USDA 2011).

Alternatives 2-5 temporary road mileage created by current and future applications as well as mileage already on the ground, proposed in other SNF projects, or estimated in the Forest Plan FEIS is estimated to range from 532 miles to 860 miles depending on the year since the decision (Table Lynx-22 and Figure 7)). This would be a range of 59 percent to 95 percent of the Forest Plan FEIS estimated mileage over the life of the project (USDA 2011).

The majority of the temporary road miles (95% of FEIS) are expected to be constructed and used in Year 4 after the Hard Rock EIS decision (Figure 8), and temporary road mileage is expected to decline every year until the project ends. Use of these roads is dependent on exploration activities. This nearly corresponds to Decade 1 estimates in the 2004 BA (USDA 2011).



Cumulatively, if these sites left accessible to public use then the risk of human/lynx conflict would increase with each year. The closure of these temporary roads and sites to easy access could reduce the risk of conflict over the remainder of the Forest Planning cycle.

Forest Plan monitoring has determined the effectiveness of road closure methods used on the Forest to restrict large and small motorized vehicle use (USDA 2009a). The use of these methods on temporary roads for minerals exploration activities could be useful in reducing the risk of human/lynx conflicts.

Indicator 13: Road and compacted trail density on all ownerships

Indicator 13 (Table Lynx-30) provides a measure of G-WL-8 which states that within LAUs generally maintain road and snow-compacting trail densities below 2 miles per sq. mile to maintain the natural competitive advantage of lynx in deep snow. Where total road and regularly-used snow-compacting trail densities are greater than 2 miles per sq. mile and coincide with lynx habitat, prioritize roads for seasonal restrictions or reclamation in those areas, where practical or feasible. In this guideline “roads” include all ownerships of classified and unclassified roads and “regularly-used trails” are those that are used most years for most of the snow season.

Table Lynx-30: Indicator 13 - Road and compacted trail density on all ownerships				
Forest-Wide LAU Conditions	# of LAUs	Land Area sq. miles	2010 Existing	
			Total road miles	Av. miles per sq. mile
Below 2 miles per sq. mile	32	2,032	2,865.3	1.4
At or above 2 miles per sq. mile	15	944	2,374.6	2.5
Data source: Existing condition USDA 2011e (2010 data)				

Tables Lynx-31 and Lynx-32 displays the road and compacted trail density on all ownerships for the critical habitat in non-LAU areas. While these areas are exempt from Forest Plan direction G-WL-8 this information is displayed to indicate the current condition in these areas.

Table Lynx-31: Indicator 13 - Road and compacted trail density on all ownerships				
Non-LAU Areas Conditions	# of NLAs	Land Area sq. miles	2010 Existing	
			Total road miles	Av. mi/sq. mi
Below 2 miles per sq. mile	4	651	739	1.14
At or above 2 miles per sq. mile	1	99	291	2.95
Data source: Existing condition USDA 2011i (2010 data)				

Table Lynx-32: NLA Road and compacted trail density on all ownerships			
NLA	Miles of route corridor	Sq. miles of CHA	Road Density (mi/sq. mi)
1	169.9	131.5	1.3
2	291.4	98.7	3.0
3	82.3	102.7	0.8
4	111.1	63.8	1.7
5	375.9	353.2	1.1
*This table does include the lake area of "other" routes that cross lakes			
Data source: Existing condition USDA 2011i (2010 data)			

Discussion: Road densities in 32 of 47 LAUs are below 2 miles per sq. mile counting conditions containing federal and non-federal ownerships.

In the foreseeable future on both federal and non-federal lands road building is expected to continue for both recreational use and land management access. Public need for access is expected to continue in these LAUs. These activities could reduce the lynx competitive advantage and increase the risk of mortality.

Between 2004 and 2010 there has been an increase of 77 miles of OML 1 and 123 miles of OML 2 roads: an increase of 10% in the first six fiscal years of Decade 1. While OML 1 and 2 roads are measured, temporary roads are not, but estimates are derived from a formula of 5.59 miles per 1,000 acres of vegetation management treatments as indicated in the Forest Plan FEIS (USDA 2004 FEIS F-21).

Based on this data and estimates an average of approx. 13 miles of OML 1, 21 miles of OML 2, and 77 miles of temporary roads could be constructed each year for vegetation management projects implemented for the remainder of Decade 1 (FY05-FY14). The Forest Plan provides direction to manage motorized vehicle use on, and closure of the potential additional OML 1, OML 2, and temporary roads at the project-level.

The Forest is continuing inventory efforts and the prioritization of roads for seasonal restrictions or reclamation in those areas with road densities above 2 miles per sq. mile. The Forest continues to improve and refine the analysis of roads and trails to calculate road and trail density on NFS lands. Over time these numbers are expected to change due to both new projects and refined analysis methods.

Because a minority of LAUs has road densities are at or above 2 miles per sq. mile and the Forest will make efforts to manage and reduce roads on the Forest cumulative effects are expected to be low for the foreseeable future.

For critical habitat in non-LAU areas four out of five have road densities below 2 miles per sq. mile (Table Lynx-32) These non-LAU habitat areas are exempted from Forest Direction G-WL-8 because they are not LAUs. However, the Forest makes efforts manage and reduce roads on the Forest for wildlife security. Area #2 along the North Shore of Lake Superior has the greatest amount of NFS lands in proportion to non-NFS lands but a high degree of mixed ownership patterns has resulted in a road density of 3.0 mi/sq. mi. in this critical habitat area. Because the Forest does not have jurisdiction and authority over non-NFS lands the cumulative effects of high road densities are expected to persist for the foreseeable future in spite of Forest road management on NFS lands.

Indicator 14: Connectivity

The information in Tables Lynx-21 and 22, supported by Moen et al. (2010), indicates that habitat connectivity does not appear to be a factor in northeastern Minnesota. Based on this information, connectivity within designated critical habitat and with Ontario, Canada appears to be excellent.

Discussion: Within the proclamation boundary, private land development and road building has the potential to impact connectivity on non-federal lands (1,236,637 acres). These developments could reduce the lynx competitive advantage and increase the risk of mortality on non-federal lands. However, the high percentage of NFS lands in this area (NFS lands = 2,125,931 acres or 63%) help offset the negative effects to connectivity from developments that lynx may encounter on nonfederal lands.

No large highway or private land developments are known to occur within the foreseeable future. Mining activities are expected to occur within the proclamation boundary, but the exchange of federal lands for these activities are expected to result in an acquisition of non-federal lands. Land exchanges are expected offset a potential loss of lynx habitat by adding land to federal management, or at least keep it at a not net loss, or add connectivity with the BWCAW Refugia and Canada. However, mining results in a net loss of habitat because of the disturbance that would occur on lands that would no longer be under federal management.

As previously discussed Canada lynx are known to roam into other portions of Minnesota outside of designated critical habitat (MN DNR 2011b). Due to factors beyond the control of the US Forest Service (such as private landownership and human developments), secure linkage areas of contiguous federal land ownership does not exist between the Superior National Forest, the Chippewa National Forest and northern Wisconsin and the Upper Peninsula of Michigan. Because secure linkage areas do not exist no cumulative effects are expected for the foreseeable future that the Forest Service can influence.

The Superior National Forest has limited ability to affect land uses outside the jurisdiction of the National Forest. However, the Forest is a partner with other federal, state, tribal governments and non-governmental organizations in landscape management initiatives therefore the Forest may collaborate with these partners to benefit wildlife species.

Climate Change

There is no definable Indicator for climate change. As stated in **3.6.2.2 General Effects** the potential implications of climate change to northern Minnesota are undetermined but continue to be studied. Galatowitsch et al. (2009) discussed potential habitat change scenarios based on an assessment of climate change projections from 16 models. No standard model has been accepted for use in predicting climate change.

For analysis purposes this BA assumes that current weather and habitat conditions will persist through the remainder of the Forest Planning cycle and into the foreseeable future, and that the implementation of the Forest Plan will not influence climate changes at either the global or North American scales.

Discussion: None of the potential projected changes for northern Minnesota are expected to occur within Decade 1 or 2 of the current Forest Planning cycle. How future potential projected climate changes would affect lynx and critical habitat is undetermined at this time. Because of this uncertainty it isn't possible to analyze the impacts of climate change for the remainder of Forest planning cycle.

While the 2004 Forest Plan FEIS (USDA 2004) did not analyze climate change in-depth, the Superior Forest Plan provides the direction that maintains and protects the resistance, resilience and redundancy of lynx and critical habitat during the Forest planning cycle.

At this point in time and for the foreseeable future, the condition of lynx critical habitat on the Superior National Forest is expected to remain suitable, available and well-distributed. No adverse cumulative effects to lynx and critical habitat are expected for the foreseeable future based on climate change.

3.7 – Determination of Effects

This BA has assessed the risk factors that address the primary constituent elements (PCEs) of designated lynx critical habitat, and to the species by evaluating the implementation of Forest Plan direction from 2004 to date. The 2004 Forest Plan and Programmatic BA occurred prior to critical habitat designation in February 2009 (USDI 2009) but contained management direction that addressed PCEs in anticipation of critical habitat designation.

Refer to Section 1.5 for the explanation for making *Determination of Effects* to Canada lynx and critical habitat.

Refer to Table A in the *Executive Summary* for the summary of effects of proposed and/or probable practices to Canada lynx and critical habitat.

Determination of Effect – Lynx
LAA: May effect but is likely to adversely affect lynx

Determination of Effect – Critical Habitat
NLAA: May effect but is not likely to adversely affect Canada lynx critical habitat

Rationale for the Determination of Effect

The analysis of effects in **Section 3.6 – Direct, Indirect, and Cumulative Effects**, based on the factors described in **Section 3.5 - Factors Affecting Lynx Environment and Analysis Indicators** provides the basis for the overall determination of effects to lynx critical habitat

In making the determination of effects, the Forest considered the direct, indirect, and cumulative effects from the risk factors and/or indicators of management actions in the following categories:

- Lynx Critical Habitat – Forested Conditions
- Human Disturbance and Access
- Resource Protection Methods and Policy

Each of these risk factor/indicator categories relate to primary constituent elements described in the Final Rule for the *Revised Designation of Critical habitat for the Contiguous U.S. Distinct Population Segment of the Canada Lynx* (FR 74 No. 36 8616-8702) (final rule) that was

published on February 25, 2009 (USDI 2009). The final rule described the primary constituent elements (PCEs) for lynx critical habitat, which contains the physical and biological features that are essential to the conservation of the species and that may require special management considerations or protections, and what types of actions may affect critical habitat.

Section 3.5.7 describes the relationship between Forest Plan lynx analysis indicators, and Forest Plan direction that addresses the primary constituent elements (PCEs) for lynx critical habitat.

This BA is not project-oriented but focused on a programmatic reconsultation of the Forest Plan based on the designation of critical habitat. The three categories listed above reflect the risk factors and/or indicators of management actions that the Forest Plan authorizes at the project-level. The determination of effect reflects whether the Forest Plan continues to provide direction to conserve critical habitat through authorized actions. The lynx critical habitat final rule described three types of Federal actions that may affect critical habitat, and therefore should result in consultation. In summary these are:

- 1) Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.
- 2) Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx. Such activities could eliminate and fragment lynx and snowshoe hare habitat.
- 3) Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. These activities could reduce connectivity within the boreal landscape for lynx, and could result in increased mortality of lynx.

The following discussion summarizes existing and foreseeable future habitat and access information and analysis in previous sections to these potential cause and effect impacts at the programmatic-level.

Lynx and Critical Habitat – Forested Conditions

For this category the implementation of the Forest Plan *may effect, but is not likely to adversely affect critical habitat*. The effects are expected to be discountable, insignificant, or beneficial to the following lynx habitats.

- Foraging
- Denning
- Connectivity (vegetation)

The determination of effect for foraging, denning and connectivity is based on information and analysis in:

- Section 3.5.4 - Lynx Habitat – Forest Condition
- Section 3.5.5 – Human Disturbance
- Section 3.6.1 - Affected Environment
- Section 3.6.2.1 – Resource Protection Methods
- Section 3.6.3 - Direct and Indirect Effects
- Section 3.6.4 - Cumulative Effects

Foraging

Based on the information and analysis in the sections listed above, the continued implementation of the Forest Plan may affect lynx critical habitat but impacts to foraging habitat are expected to be insignificant, discountable, or beneficial because:

- Forest vegetation management activities are creating and managing 837,065 acres of well-distributed snowshoe hare habitat in LAUs and non-LAU critical habitat areas (Tables Lynx-17 and Lynx -18, p. 115) across the Forest through Decade 1 in LAUs. All indications are that beyond Decade 1 the same results can be expected.
- At no time during Decade 1 does unsuitable habitat exceed the maximum 15% unsuitable threshold (**S-WL-1**) on NFS lands in LAUs (Table Lynx-27, p.132). All indications are that beyond Decade 1 the same results can be expected based on implementing Forest Plan direction.
- At no time during Decade 1 does unsuitable habitat exceed the maximum 30% unsuitable threshold (**G-WL-3**) on all ownerships in LAUs (Table Lynx-28, p.133). All indications are that beyond Decade 1 the same results can be expected based on implementing Forest Plan direction.
- Forest direction exists to guide vegetation management activities to create and manage for snowshoe hare habitat in non-LAU mixed ownership areas where the Forest Service is a minority landowner (Section 3.5.4, p.65).
- Research has indicated the red squirrel are not the important prey species as previously thought therefore this indicator is proposed to be dropped from further use (Section 3.3.2, p. 57).

Denning

Based on the information and analysis in the sections listed above the continued implementation of the Forest Plan may affect lynx critical habitat, but impacts to denning habitat are expected to be insignificant, discountable, or beneficial because:

- There is no indication that during Decade 1 denning habitat would fall below the threshold of a minimum of 10% forested habitat in denning habitat (**G-WL-4**) (Table Lynx-8, p.93, Tables Lynx-19 & 20, p.117 & 118). There is no indication that the 2004 BA estimates of between 31% and 45% in the first two decades are not valid based on implementing Forest Plan direction.
- Recent research results indicate that about 25% of the landscape in northeastern Minnesota consists of suitable lynx denning habitat (Section 3.5.4.3, p.71). Based on this information denning habitat is considered to be abundant, available, and well-distributed. Modeling indicates that denning habitat is interspersed with foraging habitat and available for use by lynx.
- Forest direction exists to guide vegetation management activities to create and manage for snowshoe hare habitat in non-LAU mixed ownership areas where the Forest Service is a minority landowner (Section 3.5.4, p.65).
- At the project-level opportunities would continue to exist to manage denning and foraging habitat at a finer scale based on Forest Plan direction (Section 3.6.2.1, p.98).

Connectivity

Based on the information and analysis in the Sections above, the continued implementation of the Forest Plan *may affect lynx* critical habitat but those impacts to connectivity are expected to be insignificant, discountable, or beneficial because:

- Research indicates that habitat connectivity does not appear to be a factor in northeastern Minnesota (Section 3.6.1, p.96). The combination of low topographic relief, the linear nature of movement paths, and the relative lack of differences in cover conditions indicate that geographically or topographically definable movement corridors do not exist for lynx either within northeastern Minnesota, or between Minnesota and Ontario, Canada. Researchers consider northeastern Minnesota forest landscape as largely un-fragmented.
- Existing Forest Plan management direction is adequate to maintain connectivity within designated critical habitat both in LAUs and non-LAU areas (Section 3.6.2.1, p.98). However, since northeastern Minnesota is the southern limit of boreal forest there is no suitable lynx habitat outside this area and off NFS lands that could be managed for lynx to the south and west.
- Across all ownerships vegetative conditions are likely to continue to provide habitat that would allow for lynx to move across the landscape. Where lynx habitat on non-NFS lands might be diminished Forest Plan direction (**G-WL-3**) exists to allow no more than 30% of all ownerships within LAUs to be in an unsuitable condition at any given time (Table Lynx-28, p.133). Since the current (2010) landscape-level existing conditions (2010) are well below this threshold (2.4% forest-wide) connectivity in critical habitat is being maintained (Table Lynx-27, p.132). All indications are that beyond Decade 1 the same results can be expected based on implementing Forest Plan direction.

- Forest Plan direction exists to allow for the Forest Service to contribute to connectivity in non-LAU areas where the Forest Service is a minority land owner (Section 3.6.2.1, p.98).

Human Disturbance and Access

For this category the implementation of the Forest Plan *may effect, but is not likely to adversely affect critical habitat*. The risk to lynx may be low to very low due to various factors, however, potential effects to critical habitat from human disturbance and access may not be entirely discountable, insignificant, or beneficial based on the following categories.

- Vegetation Management Activities
- Recreation, Roads and Trails Management/Policy
- Connectivity (Route Density/Linkages)

The determination of effect for foraging, denning and connectivity is based on information and analysis in:

- Section 3.5.5 – Human Disturbance
- Section 3.6.1 - Affected Environment
- Section 3.6.3 - Direct and Indirect Effects
- Section 3.6.4 - Cumulative Effects

Vegetation Management Activities – Determination of Effects

Based on the information and analysis in the sections above, the continued implementation of the Forest Plan *may effect, but is not likely to adversely affect lynx and critical habitat* but those impacts from vegetation management may not be entirely insignificant, discountable, or beneficial because:

- Some vegetation management projects may temporarily reduce snowshoe hare habitat and lynx habitat. Forest Plan direction continues to provide guidance to enhance or maintain lynx critical habitat whether in LAUs or non-LAU areas (Section 3.6.2.1, p.98).
- Temporary roads may be constructed as part of vegetation management projects. The effectiveness of road closures has been monitored and confirmed by the Forest monitoring program. 81% of the monitored closures were found to be totally effective (Section 3.9 p.147).
- In the event a lynx may be displaced from an area that it uses, any stress from the displacement, or disruption of use patterns is expected to be low. Considering the large area of the Superior National Forest within the designated lynx critical habitat area, the relatively low population of resident lynx, and the varied landscape conditions across the Forest, the potential and number of lynx is expected to directly impacted by vegetation management practices is expected to be very low. Since Forest Plan implementation in 2004 no lynx have been known to be impacted by vegetation management projects.

- Stress or displacement from denning habitat being used by individual lynx may occur, but is expected to be low and temporary. The potential of effects from vegetation management activities on available denning habitat is expected to be minimal since denning habitat is generally abundant across the Forest. Forest Plan direction exists to protect any denning sites that may be located in a project area whether in LAUs or non-LAU areas (Section 3.6.2.1, p.98).

Recreation, Roads and Trails Management/Policy – Determination of Effects

Based on the information and analysis in the sections above, the continued implementation of the Forest Plan *may affect lynx critical habitat* but those impacts from recreation, roads and trails management policy are expected to be insignificant, discountable, or beneficial because:

- Densities of OML 2 miles, resulting from vegetation management projects and the 2009 TMP, are higher than anticipated. However, lynx incidental mortality on NFS-managed roads has been very low, and much lower than the original determinations in the 2004 BA and biological opinion (Section 3.6.4, p. 137).
- The potential for cross-country use of ATVs and snowmobiles is very rare and limited due to the very densely forested environment on the Forest (Section 3.6.3, p. 121).
- There is no indication that winter-dispersed recreation is either causing increased access for competitors or increasing access for bobcat on the Superior NF(Section 3.3.5, p.59)
- The potential impacts of winter dispersed recreation have been assessed in every vegetation management project since 2004 that includes road construction. Forest Plan direction exists to manage or consolidate both summer and winter dispersed recreation on roads and trails (Section 3.6.2.1, p.98).
- The Forest has planned for implementation of consolidation motorized recreation use. The Forest continues to direct that no net increase in designated snow-compacting trails shall occur (Section 3.6.3, p. 121). Therefore there should not be an increase in other-predator access into lynx habitat and subsequent competition with lynx from proposed and approved winter recreation routes.

Connectivity (Route Density/Linkages) – Determination of Effects

Based on the information and analysis in the sections above, the continued implementation of the Forest Plan *may effect, but is not likely to adversely affect lynx and critical habitat* but those impacts to connectivity are expected to be insignificant, discountable, or beneficial because:

- Road densities in 32 of 47 LAUs are below 2 miles per sq. mile accounting for conditions in both federal and non-federal ownerships (Table Lynx-30, p.136). For non-LAU critical habitat areas four out of five have road densities below 2 miles per sq. mile (Table Lynx-32, p.137) the Forest is continuing the prioritization of roads for seasonal restrictions or reclamation in those areas above 2 miles per sq. mile.

- Forest Plan direction exists to manage roads for USFS projects in non-LAU mixed ownership areas where the Forest Service is a minority landowner (Section 3.5.4, pgs 67-68).
- Research indicates that lynx move freely across the northeastern Minnesota landscape without being significantly influenced by existing NFS- and non-NFS managed road network (Section 3.6.1, p.96).
- Due to factors beyond the control of the US Forest Service secure linkage areas of contiguous federal land ownership does not exist between the Superior National Forest, the Chippewa National Forest and northern Wisconsin and the Upper Peninsula of Michigan due to private landownership and human-developments (Section 3.6.3, p 120).
- No large highway or private land developments are known to occur within the foreseeable future.
- Mining activities are expected to occur within the proclamation boundary, The exchange of federal lands for these activities is expected to result in an acquisition of non-federal lands through land exchanges. Some exchanges may or may not benefit connectivity. This is not expected to result in a potential loss of connectivity with other critical habitat on general NFS lands, the BWCAW Refugia and Canada. Due to the lack of where mining activities may occur over time the potential impacts to connectivity from individual mining activities would be addressed with project-level analysis and consultations.

Resource Protection Methods and Policy

For this category the implementation of the Forest Plan *may effect, but is not likely to adversely affect lynx and critical habitat*. The effects are expected to be discountable, insignificant, or beneficial to the following lynx habitats based on the following methods and policies:

- Maintaining or enhancing lynx critical habitat
- Reducing or eliminating the impacts of Forest activities or programs

The determination of effect for the above methods and policies is based on information and analysis in:

- Section 3.5.4 - Lynx Habitat – Forest Condition
- Section 3.5.5 – Human Disturbance
- Section 3.6.1 - Affected Environment
- Section 3.6.2.1 – Resource Protection Methods
- Section 3.6.3 - Direct and Indirect Effects
- Section 3.6.4 - Cumulative Effects

Maintaining or enhancing lynx critical habitat – Determination of Effects

Based on the information and analysis in the sections above, the continued implementation of the Forest Plan *may effect, but is not likely to adversely affect lynx and critical habitat*. The Forest Plan (Section 3.6.2.1, p.98) continues to implement integrated resource conservation measures (objectives, standards and guidelines) that considered and adopted applicable measures from the Lynx Conservation Assessment and Strategy (LCAS) Ruediger et al 2000). The two points made in the 2004 BA remain valid.

- The Forest Plan continues to promote the proactive conservation of lynx and habitat (now critical habitat) by maintaining or enhancing extensive areas of lynx habitat by integrating habitat objectives into management activities on NFS lands in LAUs and non-LAU areas. These activities maintain or enhance native vegetation communities that support the lynx prey base, as well as a well-distributed denning and connectivity habitat to maintain the competitive advantage of lynx over competitors in deep snow.
- The Forest Plan continues to promote actions to reduce or, eliminate adverse effects or risks to lynx and critical habitat that may result from management activities and programs in LAUs and non-LAU areas.

Reducing or eliminating the impacts of Forest activities or programs – Determination of Effects

Based on the information and analysis in the sections above, the continued implementation of the Forest Plan *may effect, but is not likely to adversely affect lynx and critical habitat*. Continued Forest Plan implementation would comply with all applicable Forest Plan management direction related to the Canada lynx and its critical habitat. However, Forest programs and activities still have the potential to directly or indirectly adversely affect lynx and critical habitat during the remainder of the Forest Plan planning cycle. The determination is based on:

- Uncertainty about the location, timing, scope and scale of expected and unforeseen land management activities.
- Uncertainty associated with reasonably foreseeable cumulative effects from National Forest and other landowners' land use within the proclamation boundary.
- These uncertainties are best addressed at the project-level where site/area-specific information is available to determine the scope and scale of potential effects on critical habitat.

3.8 - Recommended Mitigations

No mitigation measures are recommended for lynx critical habitat at the Forest Plan programmatic level. This is because existing management direction in the Forest Plan anticipated the designation of critical habitat, and has incorporated Resource Protection Methods (**Section**

3.6.2.1) for conserving lynx and the critical habitat that the species depends on. These measures serve to mitigate or eliminate potential adverse impacts to lynx and critical habitat. Existing management direction has been assessed in relation to Primary Constituent Elements (PCEs) of critical habitat (**Section 3.5.7**)

As indicated in the 2004 BA, it is impossible to provide management direction that would address all possible actions and activities, in all locations across the broad landscape of the Superior National Forest. However, the comprehensive management direction in the Plan is applied, at the project-level, to all actions that have the potential to impact lynx. Circumstances unique to individual projects or actions may still result in negative impacts to lynx in some locations. In these cases, additional or modified mitigation measures may be necessary to avoid or minimize adverse impacts in project-level consultations with the U.S. Fish and Wildlife Service.

However, it is recommended that all access roads be closed to motorized use by the public while management activities are occurring, and that those sites be effectively rehabilitated after final usage has occurred. This should minimize or eliminate the risk of human/lynx conflicts.

3.9 - Monitoring

The Forest Plan identified three broad and strategic monitoring questions related to threatened and endangered species (Chapter 4, Table MON-4):

1. To what extent is Forest management contributing to the conservation of threatened and endangered species and moving toward short term (10-20 years) and long-term (100 years) objectives for their habitat conditions and population trends?

Discussion: 2010 Status – Between fiscal (FY) 2005 to FY2010, approximately 13,253 acres of diversity and under-planting has occurred on the Forest in which within-stand structure has improved snowshoe hare habitat. Based on these accomplishments it is estimated that an additional 8,835 acres could be accomplished within the remainder of Decade 1(FY11-FY14). The 2010 data indicates that unsuitable conditions are within the **G-WL-3** 30% threshold for Decade 1. More than 2.4% of lynx habitat would remain suitable across all ownerships within the Decade 1 period. The 2010 data indicates that unsuitable conditions are within the **S-WL-1** 15% threshold for the foreseeable future. More than 3.9 % of lynx habitat would remain suitable on NFS lands within the Decade 1 period. There is no indication that during Decade 1 denning habitat would fall below the threshold of a minimum of 10% forested habitat in denning habitat (**G-WL-4**).

2. To what extent are road and trail closures effective in prohibiting unauthorized motor vehicle use?

Discussion: 2010 Status - The effectiveness of road closures has been monitored by the Forest monitoring program. In 2009 the “Nira Stewardship Project” was evaluated to determine the effectiveness of road closure methods used on the Forest to restrict large and small motorized vehicle use. Twenty-two (81%) of the 27 closures were found to be totally effective in making the

road opening unnoticeable. At four sites where vegetation plantings were not successful, the report concluded that the road obliterations were still effective in keeping motorized use to a minimum (USDA 2009b).

The Forest Plan objective is to decommission approximately 80 miles of road by 2014 (USDA 2010g). Since 2004 approximately 34 miles of road have been decommissioned and an additional 109 miles of roads have been approved for decommissioning but not yet accomplished. When fully implemented, a total of 143 miles of roads will have been decommissioned across the SNF. Additional roads may be identified for decommissioning.

Road densities in 32 of 47 LAUs are below 2 miles per sq. mile accounting for conditions in both federal and non-federal ownerships.

3. To what extent is the Forest maintaining no net increase in groomed or designated over-the snow trail routes unless the designation effectively consolidates use and improves lynx habitat through a net reduction of compacted snow areas?

Discussion: 2010 Status - The Forest has not constructed any new ATV and snowmobile trails since 2004. Since no additional ATV and snowmobile trails have been constructed should be no additional impacts to lynx habitat. For example, the TMP decision in 2009 added 142 miles of existing unclassified roads to the Forest system while decommissioning 154 miles of unclassified roads. This action reduced the overall amount of motorized road density in lynx habitat and is consistent with Forest Plan direction **G-WL-8** (USDA 2004a, p.2-30) which is used to assess and manage road and snow-compacting road density (USDA 2011f, and USDA 2008).

Research - The 2004 BA indicated that monitoring and reporting frequency for lynx populations would be at least once every five years for the life of the Plan with a low to moderate degree of precision and reliability. However, prior to and since the 2004 time period researchers and land managers have been studying the distribution, abundance, persistence, and habitat use of Canada lynx in northeastern Minnesota. Annual reports, publications, and theses have been produced on lynx ecology in northeastern Minnesota (NRRI 2010). The Superior NF, in cooperation with researchers, the USFWS and non-NF personnel have been annually collecting and lynx DNA material to determine population abundance, status and distribution information. There has been a greater frequency and higher degree of precision of monitoring as described in the 2004 BA. Due to the free sharing of information the annual reports specified in the Forest Plan were not officially completed since federal, state and researchers all shared the data annually.

The Superior NF continues to support and work with partners to better understand lynx ecology, habitat use and long-term persistence in northeastern Minnesota.

Section 4 – Effects of other Probable Practices on Wolf and Canada Lynx

Background

This section (Section 5 in the 2004 BA) provides analysis on potential impacts to federally-listed species from two additional programs on NFS lands: backcountry campsite development and Special Use Permits for human access. Potential impacts are based on estimated maximum amounts during the Plan implementation period, without reference to timing or location. These two programs are consistent with and allowed by the Forest Plan. Direction is primarily found in Chapter 2

4.1 - Backcountry Campsites

Gray wolf and Canada lynx

Environmental Effects

No new back country campsites have been constructed outside the BWCAW since 2004.

Resource Protections

The Superior and Chippewa National Forest Plans provide management direction to ensure conservation of each species and their critical habitat. The key direction in the Plans are located in the Threatened and Endangered Species sections, and wolf- and lynx-specific direction is summarized in Sections 3.6.2 and 4.6.2 Environmental Consequences; Resource Protections -pgs. 64-67 for wolf and pgs. 127-133 for lynx. Additional direction includes;

- **D-REC-3:** The Forest provides developed sites, facilities, trails, water access sites, and other recreation opportunities within health, safety, resource protection (including wolf and lynx), cost and maintenance requirements.

Direct , Indirect and Cumulative Effects

Construction, maintenance, and use of new campsites have a very low potential to impact gray wolf and lynx. Direct impacts to wolf and lynx are unlikely but mainly involve the loss of available habitat due to the campground area being developed versus keeping the area undeveloped. Potential indirect and cumulative impacts could result from human disturbances such as noise, or other human-related disturbances that could displace wolves or lynx from nearby breeding locations annually and over time.

Determination of Effects

The construction, maintenance, and use of new backcountry campsites *may effect, but is not likely to adversely affect gray wolf, Canada lynx and their critical habitats*. Although there are potential direct, indirect or cumulative effects, the risk to gray wolf and lynx are low.

As in 2004, the Forest believes that in the future at the individual project-level, that these projects may actually have no effect on both species because of the uncertainty on timing and location of these types of projects during the remainder of the Forest planning cycle. However, the Forest cannot determine that there is no possibility of effects. Campsites are not likely to affect both species based on the following reasons.

- Based on the abundant amount of available habitat across the Forest, the construction and use of campsites would impact a very small amount of habitat for both species.
- Most campsites will be at waters' edge (e.g. rivers, lakes or streams). The likelihood that of a wolf or lynx denning occurring at water's edge is very low.
- Generally campsites would not occur at sites that are typically suitable for wolf or lynx denning.
- Both wolves and lynx generally tolerate human presence such that it is unlikely that human disturbance would be great enough to displace animals or cause a loss of productivity.
- Forest management direction exists that promotes the conservation of both species, and ensures that if a denning site is located near a proposed new campsite that measures would be taken to relocate the campsite, and or use temporary closures to protect the integrity of the den site.

4.2 - Special Use Permit Roads

Background

Special Use Permit (SUP) roads are roads on NFS lands providing access to other land ownerships where no other reasonable access is possible on non-federal lands. These roads are under a special-use authorization that provides permission, without conveying an interest in land, to occupy and use NFS lands for a specific purpose. SUP roads require both transportation planning and environmental analysis under the National Environmental Planning Act (NEPA). Project-level planning and analysis ensures that the conservation of federally-listed species is considered.

Two types of roads account for the greatest number of SUPs – temporary and permanent. Approximately 66% of the permits issued on the Forest are temporary. The remainder provides permanent access to private in-holdings. These are typically private driveways to residences or seasonal cabins, or low traffic volume roads serving a number of landowners in a local area. SUPs

can also be issued to provide access on foot, OHV (ATVs) or a snowmobile trail. For analysis purposes it is assumed that all types of human access are equivalent to roads.

Environmental Effects

Discussion: Since 2004 Special Use Permit (SUP) existing roads that access private property such as homes or summer cabins have amounted to approximately 470 SUP roads covering 213 miles (USDA 2010d). The management of these Special Use Permits (SUP) roads relates to lynx through Forest Plan direction **S-TS-4** (USDA 2004a, p.2-50). The 2004 BA estimated a maximum of 326 miles SUP miles only for Decade 1 (USDA 2004b – **Section 5.2**). There were no estimates made for Decade 2 in the 2004 BA.

The 2004 BA did not discuss mineral exploration activities as needing and using special-use permits. The Federal Hard Rock Mineral Prospecting Permits project EIS (USDA DRAFT EIS 2011) is expected result in approximately 860 miles of temporary roads constructed over the next 20 years for minerals prospecting (drilling) (see **Section 3.6.4 – Cumulative Effects**). Most of these prospecting roads would use a “Road Use Permit” much like those used in timber sales when operating on NFS lands, however some temporary roads may need a Special Use Permit (SUP). The 20 year analysis period for the Hard Rock Prospecting EIS will exceed the lifespan of the current Forest Plan (USDA 2011).

At this time it’s impossible to determine the number of temporary roads that may require a Special Use Permit (SUP) over the next 20 years. Only those temporary roads that occur on NFS lands to access privately-owned mineral rights would require a Special-Use Permit even on NFS-managed surface lands.

It was estimated that approximately 25% of the temporary roads for this minerals exploration project may require a special use permit under the maximum estimate of 860 miles (Table Lynx-22 – Cumulative Effects) (USDA 2011a). This differs from the formula used in the 2004 BA based on state, county or private forestry and private residences access needs (USDA 2004b – Table 5-2 #2) . The estimate for the Federal Hard Rock Minerals Prospecting Permit EIS roads would result in approximately 215 miles of additional SUP permitted roads. Most of the temporary road miles (95% of FEIS) are expected to be constructed and used in Year 4 after the Hard Rock EIS decision (Figure 6 – Cumulative Effects). Total mileage is expected to decline every year until the permits ends. This nearly corresponds to the Decade 1 (2004-2014) period in the 2004 BA, however the Year 4 peak may slip into Decade 2 depending on the date of the Federal Hard Rock Mineral Prospecting Permits Record of Decision.

If 95% of the temporary roads occur within the first four years of a potential 2011 decision date this equals approximately 204 SUP miles. Adding these miles to the existing 213 SUP miles totals 413 SUP miles. This would be 91 more miles than the maximum estimate of 326 SUP miles estimated in the 2004 BA. However, as stated above, it is uncertain that the first four years of the Hardrock Prospecting Project will occur within Decade 1.

The remaining 645 miles (75% of 860) would operate under a minerals operating plan with Road-Use Permits (USDA 2011a). The direct, indirect and cumulative effects of SUP and non-SUP

Prospecting EIS temporary roads to lynx and critical habitat are discussed in both **Section 3.6.4 – Cumulative Effects**, and this section.

Resource Protections

The Forest Plan provides management direction to ensure federally-listed conservation is addressed at the project-level. The key direction in the Plan is located in the Threatened and Endangered Species sections, and wolf- and lynx-specific direction is summarized in **Sections 3.6.2 and 4.6.2 Environmental Consequences; Resource Protections** - pgs. 64-67 for wolf and pgs. 127-133 for lynx. Additional direction includes;

1. **FSM 2730.2** – Provide access across National Forest System land to private land that is adequate to secure the owners thereof of reasonable use and enjoyment of their land without unnecessarily reducing the management options of the Forest Service or damaging national Forest System lands or resources.
2. **FSM 2734.6** –The appropriate mode or type of access selected should be one that is both reasonable for the planned use of the private land and, insofar as possible, compatible with the Forest land and resource management plans for the National Forest System lands.

The Superior National Forest generally manages SUP roads under direction similar to NFS roads. For temporary roads, an SUP requires effective closure and decommissioning by permittees, and Forest Plan direction **S-TS-3, G-TS-12, and G-TS-14** would generally apply. For OML-2 type roads, like those used for short-term management purposes, Forest Plan direction **O-TS-3, O-TS-7, and G-TS-12** would generally apply. The Forest Service may require SUP roads to be gated if necessary for resource protection.

Direct, Indirect and Cumulative Effects

SUP roads may have potential impacts that are generally similar to OML 1, OML 2 and temporary roads. These impacts are summarized for gray wolf (**Section 2-7.3 – Direct and Indirect Effects** and **Section 2.7.4 – Cumulative Effects**) and Canada lynx (**Sections 3.6.3 – Direct and Indirect Effects** and **3.6.4 – Cumulative Effects**).

While SUP roads generally have low traffic volume when they are open there are increased risks to federally-listed species such as;

- The direct loss of available habitat due to the construction of an SUP road, but the scope of the impact would depend on whether the SUP road is temporary or permanent.
- Indirectly, the potential increased human access and disturbance into federally-listed species habitat which could result in accidental or intentional harm to individuals of listed species from trapping or shooting,
- Indirectly for lynx, the potential for increased inter-specific competition exists due to snow compaction.

Other specific considerations exist for SUP roads. Temporary, OML-1 and OML-2 type SUP roads are those roads that have the greatest potential for harm to wolf and lynx, because they can provide access to non-NFS lands outside the jurisdiction of the US Forest Service. The type, amount and season of use of these roads may have varied effects to wolves and lynx. Regular use can be considered and mitigated when permits are issued such as gates to limit access to just those permitted. However, the risk of unauthorized use after the road is closed would remain.

Private drive-way SUP roads should have different effects due to the limited length of drive-ways but this could be offset by a potential for higher frequency of use and human occupation in lynx and wolf habitat. However, the National Forests have limited ability to affect these potential effects since the Forests must provide reasonable access to private lands. In addition, the Forests may not have an influence on the rapidity or extent of human developments on private or other non-NFS lands.

The potential for cumulative effects would be related to the increase over time of the scope and scale of human developments in available habitat over time. However, the scope and scale of these potential cumulative effects could depend on whether wolves or lynx would be displaced from currently used areas. Both wolves and lynx generally tolerate human presence enough that is unlikely that human disturbance would be great enough to displace animals or cause a loss of productivity. Permanent SUP roads have the greatest potential for cumulative effects due to their permanent usage versus temporary SUP roads.

Determination of Effects

The permitting of SUP roads, *may effect, but is likely to adversely affect gray wolf and Canada lynx*. Although there are potential direct, indirect or cumulative effects, the risk to gray wolf and lynx are low.

In general, the rationale for this determination is similar to that used for gray wolf in **Section 2.8** (page 46) and **Section 3.7** (page 140) for lynx. However, permitting SUP roads *may effect but is not likely to adversely affect Gray wolf and Canada lynx critical habitats*.

The monitoring of roads will continue to be an important factor as described for lynx in **Section 3.9** (pgs. 148-149), and ensure that SUP roads, especially those used for forest management by other agencies and businesses, are planned, managed and used according to the issued permits.

Prepared by: Alan Dohmen, Forest Biologist
USDA – Forest Service, Superior National Forest
8901 Grand Avenue Place, Duluth, MN 55808
(218) 626-4304
adohmen@fs.fed.us

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